

project
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DATA QUALITY MONITOR AND CONSOLE MERCURY CONTROL CENTER

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CHAPTER 1

INTRODUCTION

1.1 PURPOSE OF MANUAL

The purpose of this manual is to provide information concerning the theory of operation, operation, installation, maintenance, and illustrated parts list for the Data Quality Monitor (DQM) (fig. 1-1).

1.2 SCOPE OF MANUAL

This manual consists of six chapters. Chapter 1 presents the purpose of the manual and that of the equipment. It also describes the equipment and its operating environment. The theory of operation is discussed in Chapter 2. A description of the controls and indicators and of the operation of the console is provided in Chapter 3. Chapter 4 contains the information necessary to install the DQM; i.e., location, floor marking, space limitations, and cabling. The chapter on maintenance (Ch 5) contains the component location information and the test procedures. Corrective maintenance procedures and troubleshooting charts which normally appear in Chapter 5 will be supplied as information becomes available. The illustrated parts breakdown in Chapter 6 lists all parts used to manufacture the console. Appendixes A through C provide the information required to understand and maintain the Sanborn Co. model 350 strip-chart recorder which is a part of the DQM.

1.3 PURPOSE OF EQUIPMENT

The DQM is an 8-channel strip-chart recording system with a console attachment and an attenuator which permit the monitoring and control of data.

1.4 DESCRIPTION

The DQM consists of a commercially produced 8-channel strip-chart recording system, manufactured by the Sanborn Co., a console attachment, and separate attenuator, produced by IBM to enable specific control and monitor functions.

The 8-channel strip-chart recording system (fig. 1-1) consists of eight driver amplifiers (one for each channel) and a power supply. The driver amplifiers are transistorized power amplifiers which raise the input to a power level required to operate the writing arm through a galvanometer.



FIGURE 1-1. DATA QUALITY MONITOR
(DQM), OVERALL VIEW

The console (fig. 1-1) provides selection circuitry which allows the operator to select alternate data sources for the information being processed or displayed. Indicators are provided to indicate the status of the various selection switches on the console.

The attenuator is added in series with the input lines to limit the input signals to each channel so that the deflection of the writing arms will not exceed their designed limits.

The DQM is housed in a standard 24-inch x 24-inch x 72-inch industrial cabinet. This unit weighs approximately 500 pounds. The DQM console is 8 x 24 x 12 inches, weighs approximately 25 pounds, and is physically attached to the cabinet structure below the recording system. A blower system is mounted below the console in the bottom of the cabinet to maintain satisfactory temperature within the unit.

The console requires 115v, 60-cycle ac and obtains this power from the recording unit. The ON-OFF switch in the top portion of the DQM controls the application of power to the console and to the recorder.

Temperature control is a function of the room and building conditioning and is augmented by the blower unit. The blower moves air from floor level through the louvered air filter, up through the cabinet, and exhausts the heated air into the room.

CHAPTER 2

THEORY OF OPERATION

2.1 GENERAL

This chapter discusses the theory of operation of the DQM. The discussion includes a block diagram analysis and a detailed circuit analysis. The latter is divided into the following functional areas: power circuitry, selection and confirm circuitry, and indicator circuitry.

Note

The 8-channel recorder is a commercial unit, and information on this unit is contained in the manufacturer's manual provided in Appendix A.

2.2 BLOCK DIAGRAM ANALYSIS

Figure 2-1 is a block diagram which shows the interconnection of the DQM with other units at the Mercury Space Flight Center. The DQM consists basically of two units: a modified 8-channel strip-chart recorder and a console unit. The console is physically attached to the recorder but is electrically connected to it only through the a-c input connection. The recorder displays (on a strip chart) data received from the D/A Converter. The console unit provides switching control and indicator circuitry (connected through the Digital Junction Box) which allows the operator to make certain selections based upon his observations of the data presented on the strip chart. In general, these selections provide alternate data sources for the information being processed. A detailed description of the console circuitry is provided in paragraph 2.3.

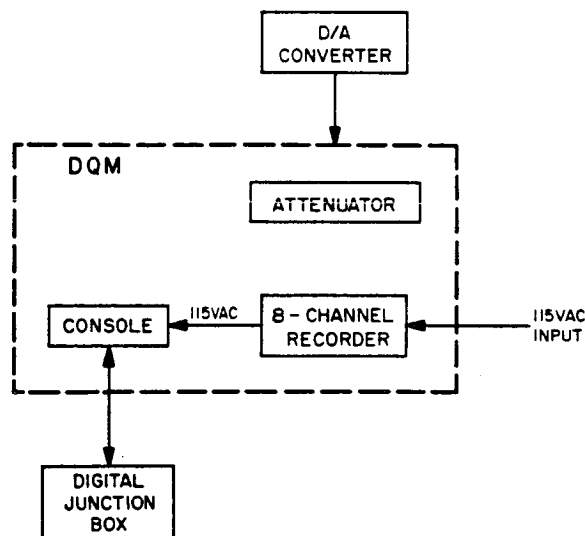


FIGURE 2-1. DATA QUALITY MONITOR
INTERCONNECTION, BLOCK DIAGRAM

2.3 DETAILED CIRCUIT ANALYSIS

Figure 2-2 is a circuit schematic for the console unit of the DQM. Refer to this figure for the following circuit discussions.

2.3.1 Power Circuitry

The 115vac input power for the console is connected from the normally open contacts of the recorder power switch to terminals a and b of TB1. Placing the recorder POWER ON switch in the ON position applies 115vac to the recorder and to the console terminal board. The input voltage is then applied, through a 2-ampere fuse (F2) and interlock S6, to the primary of power transformer T1. This transformer has four primary taps for input voltages of 124, 117, 110, or 103vac. The output of the transformer is applied to a full-wave rectifier network (CR1) which provides a 48v output for the unit. The 48v output is also applied to POWER ON indicator DS23.

2.3.2 Selection and Confirm Circuitry

2.3.2.1 IBM 7090 Selection Circuitry

The IBM 7090 selection switch (S3) is a 2-position switch used to select either of two sources for input data being processed by the IBM 7090 computer. In one position, data from the IP-709 computer or data from radars (whichever data source is active) is fed to the IBM 7090. In the other position, data from the B-GE computer is fed to the IBM 7090 computer.

When switch S3 is in the select IP-709 or radars position, closed contacts B2 and B3 complete the ground return for the IP-709 OR RADAR indicator (DS6), causing the indicator to light. Open contacts A2 and A3 break an external circuit which causes radar data or IP-709 computer data (whichever data source is active) to be connected to the IBM 7090 computer. If the IP-709 is active, closure of external relay contacts in the Digital Junction Box completes the ground return (through P716-T and P716-21) for the CONFIRM IP-709 indicator.

If the radars are active, closure of relay contacts in the Digital Junction Box completes the ground return (through P716-U and P716-22) for the CONFIRM RADAR indicator.

When switch S3 is placed in the select B-GE position, closed contacts B1 and B2 complete the ground return for the SELECT B-GE indicator (DS5), causing the indicator to light. Closed contacts A1 and A2 complete a circuit to the IBM Interface Junction Box and then to the Telemetry Event Buffer where a 1 bit in the message format (to the IP buffer and B-GE buffer) causes the IBM 7090 to furnish display data to the Mercury Control Center based on the B-GE computer data input. (A 0 bit appears in the message format when IP-709 or radar is selected.) Closure of relay contacts in the Digital Junction Box completes the ground return (through P716-V and P716-22) for the CONFIRM B-GE indicator (DS11).

2.3.2.2 Plot Boards I, II Circuitry

The PLOT BOARD I, II switch (S2) selects the source of data being displayed on Plot Boards I and II.

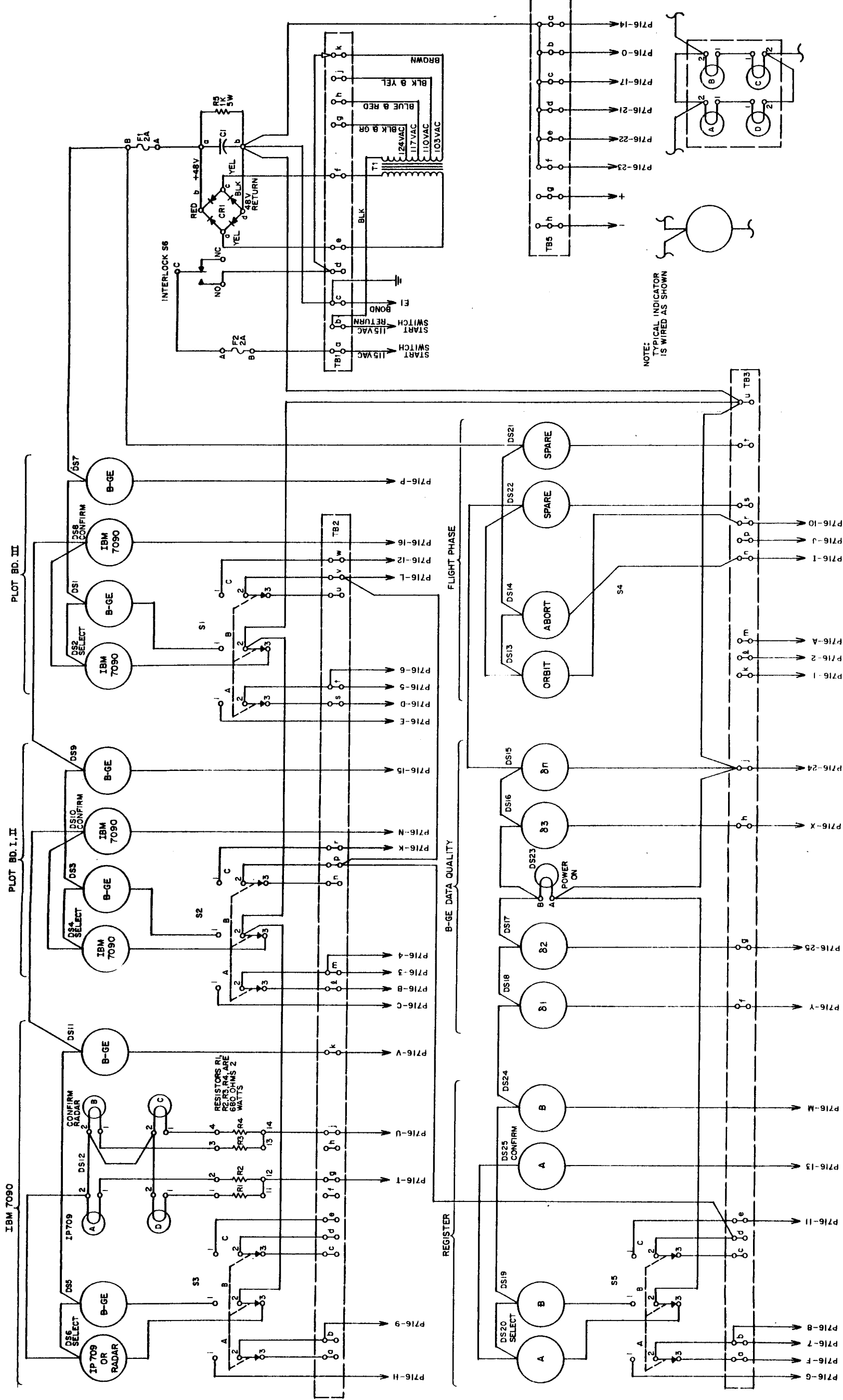


FIGURE 2-2. WIRING DIAGRAM, DATA QUALITY MONITOR (DQM) CONSOLE

When switch S3 is in the select IBM 7090 position, the SELECT IBM 7090 indicator is lit by completion of a ground return through contacts B2 and B3 of S2. A SELECT IBM 7090 indicator contact closure is also provided for the Stromberg Interface Unit through pins P716-B and P716-3, which activates the switching circuitry to connect the 7090 computer to Plot Boards I and II.

The CONFIRM IBM 7090 indicator for Plot Boards I and II is lit by closing relay contacts in the Switch Unit which are in series with pin P716-N (connected to the indicator) and P716-17 (the DQM 48v return).

Switching S2 to the select B-GE position lights the SELECT B-GE indicator by providing a ground return through contacts B1 and B2 of S2. Selection of the B-GE equipment is made at the Switch Unit by completing a ground return in the Switch Unit when contacts C1 and C2 of S2 are closed. The connection to the Switch Unit is wired to P716-K and is returned at P716-L. The SELECT B-GE indicator circuit is also completed to the Stromberg Interface Unit (through P716-C and P716-4) by closing contacts A1 and A2 of the selection switch.

The CONFIRM B-GE indicator circuit is completed by relay contact closures in the Switch Unit which are connected to the indicator at P716-15 and to the 48v return at P716-O.

2.3.2.3 Plot Board III Circuitry

The PLOT BOARD III switch (S1) selects the source of data being displayed on Plot Board III. The circuit operation is basically the same as that for Plot Boards I and II. Contacts A2 and A3 activate the switching circuitry to select the IBM 7090 as a data source for Plot Board III.

Contacts B2 and B3 provide a ground return for the SELECT IBM 7090 indicator (DS2). Contacts C1 and C2 activate switching circuitry to select the B-GE equipment as a data source for Plot Board III. Contacts A1 and A2 complete the SELECT B-GE indicator circuit to the Stromberg Interface Unit. The Confirm indicators are connected to the Switch Unit through P716-16 and P716-P.

2.3.2.4 Register Circuitry

The REGISTER switch (S5) is used to select one of two registers (A or B) for information transfer.

When the REGISTER switch is in the select A position, the SELECT A indicator is lit by a ground return completion through closure of contacts B2 and B3. Closure of contacts A2 and A3 completes a circuit (through P716-F and P716-7) which is terminated at the Digital Junction Box. No contact closure for the register A selection is provided to the Switch Unit because the normal input to this unit is the A register. The CONFIRM A indicator connections to the Switch Unit are received at P716-13, which is connected to the indicator, and at P716-14, which is the return. When the CONFIRM A indicator is lit, register A is the active data source at the Switch Unit.

When the selection switch is set to the select B register position, the SELECT B indicator is lit by the closure of contacts B1 and B2. Simultaneously, contact closures are provided at A1 and A2 and at C1 and C2. Closure of C1 and C2 provides a ground return path at P716-11, which is a line connected through the Digital Junction Box to the Switch Unit. This closure picks relays in the Switch Unit to select the B register as the data

source. A ground return is then supplied by the Switch Unit at pin M of P716 to light the CONFIRM B indicator. Contact closures A1 and A2 provide status indication lines (through P716-G and P716-7) to the Digital Junction Box where the lines are terminated. If necessary, these lines are available through jumper connections at the box.

2.3.3 Indicator Circuitry

2.3.3.1 Data Quality Indicators

There are four indicators (δ_1 , δ_2 , δ_3 , and γ_n) on the console which are used as status indicators. When lit, these indicators provide the operator with the following information:

- δ_1 - Indicates that the B-GE is integrating rate of change to obtain position of the capsule.
- δ_2 - Indicates that the B-GE is differentiating range azimuth and elevation to obtain rate of change.
- δ_3 - Indicates that the B-GE is differentiating track data for lateral rates of change.
- γ_n - Indicates that the track data being provided to the B-GE is not sufficient for the computer to generate guidance commands.

Each of these indicators is individually lit by the completion of external ground return circuits.

2.3.3.2 Flight Phase Indicators

The flight phase indicator circuitry includes an Orbit, Abort and two spare indicators. During the Launch Phase, no indicators will be lighted. If an Abort Phase is initiated, the ABORT indicator will light. If Orbit has been achieved, the ORBIT indicator will light.

2.3.4 Attenuator Circuitry

The line attenuator limits the input signal so that the writing arms will not exceed their travel. Figure 2-3 shows the attenuator circuitry.

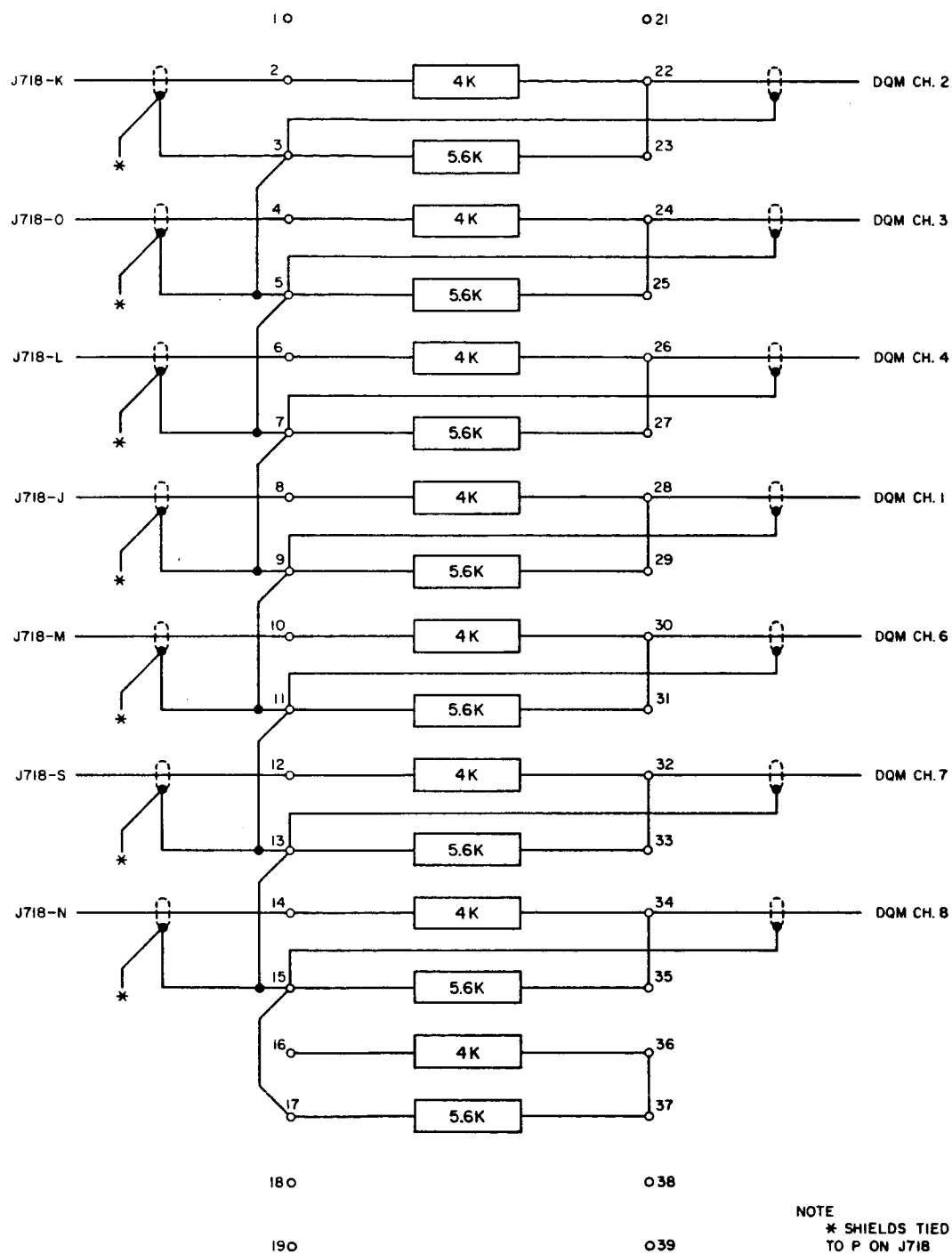


FIGURE 2-3. DQM INPUT ATTENUATOR (SCHEMATIC)

CHAPTER 3

OPERATION

3.1 GENERAL

This chapter describes the controls and indicator lights on the DQM console attachment and the operation of the console.

3.2 CONTROLS AND INDICATORS

Figure 3-1 shows the panel and its controls and indicators. Tables 3-1 and 3-2 list the controls and indicators, respectively, of the DQM.

TABLE 3-1. DQM CONTROLS AND FUNCTIONS

Switch	Position	Function
IBM 7090		4-circuit, 2-position switch which selects the source of incoming data being processed by the IBM 7090 for use by the Mercury Control Center.
	IP-709 or Radar	Selects the IP-709 or radars as the source of data.
	B-GE	Selects the B-GE equipment as the source of data.
PLOT BD I, II		Selects the source of data being plotted on Plot Board I or II.
	Select IBM 7090	Selects a group of 50 data bits from the IBM 7090 to be plotted on Plot Board I or II.
	Select B-GE	Selects a group of 50 data bits which originate at the B-GE equipment to be plotted on Plot Board I and II.
PLOT BD III		Selects the source of data to be plotted on Plot Board III.

TABLE 3-1. DQM CONTROLS AND FUNCTIONS (cont'd)

Switch	Position	Function
REGISTER	Select IBM 7090	Selects a group of 30 bits of data being processed by the IBM 7090 to be plotted on Plot Board III.
	Select B-GE	Selects a group of 30 bits of data being processed by the B-GE equipment to be plotted on Plot Board III.
	Select A	Selects one of two identical registers for information transfer.
	Select B	Allows register A to be made active. Allows register B to be made active.

TABLE 3-2. DQM INDICATORS AND FUNCTIONS

Switch	Indicator	Function
IBM 7090	SELECT IP-709 OR RADAR (White)	Indicates that the IP-709 or radar data has been selected as the source data to be processed on the IBM 7090 for Mercury Control Center use.
	CONFIRM IP-709 (Green)	Indicates that IP-709 data is available to the IBM 7090.
	CONFIRM Radar (Green)	Indicates that radar data is available to the IBM 7090.
	SELECT B-GE (White)	Indicates that the data from the B-GE equipment has been selected to provide information for the IBM 7090.
	CONFIRM B-GE (Green)	Indicates that the selected information is available to the IBM 7090.

TABLE 3-2. DQM INDICATORS AND FUNCTIONS (cont'd)

Switch	Indicator	Function
PLOT BD I, II	SELECT IBM 7090 (White)	Indicates that the IBM 7090 data has been selected for presentation on Plot Boards I and II.
	CONFIRM IBM 7090 (Green)	Indicates that the IBM 7090 data is being presented on Plot Boards I and II.
	SELECT B-GE (White)	Indicates that the B-GE data has been selected for presentation on Plot Boards I and II.
	CONFIRM B-GE (Green)	Indicates that B-GE data is being presented on Plot Boards I and II.
PLOT BD III	SELECT IBM 7090 (White)	Indicates that the IBM 7090 data has been selected for presentation on Plot Board III.
	CONFIRM IBM 7090 (Green)	Indicates that the IBM 7090 data is being presented on Plot Board III.
	SELECT B-GE (White)	Indicates that the B-GE data has been selected for presentation on Plot Board III.
	CONFIRM B-GE (Green)	Indicates that the B-GE data is being presented on Plot Board III.
REGISTER	SELECT A (White)	Indicates that the A register has been selected for information transfer.
	CONFIRM A (Green)	Indicates that the A register is transferring information.
	SELECT B (White)	Indicates that the B register has been selected for information transfer.
	CONFIRM B (Green)	Indicates that the B register is transferring information.

TABLE 3-2. DQM INDICATORS AND FUNCTIONS (cont'd)

Switch	Indicator	Function
B-GE DATA QUALITY	δ_1	Indicates that the B-GE is integrating rate of change to obtain position of capsule.
	δ_2	Indicates that the B-GE is differentiating range azimuth and elevation to obtain rate of change.
	δ_3	Indicates that the B-GE computer is differentiating track data for lateral rates of change.
	γ_n	Indicates that the track data being provided to the B-GE is not sufficient for the computer to generate guidance commands.
FLIGHT PHASE	Abort	Indicates that an Abort Phase has been initiated.
	Orbit	Indicates that an Orbit Phase has been initiated.

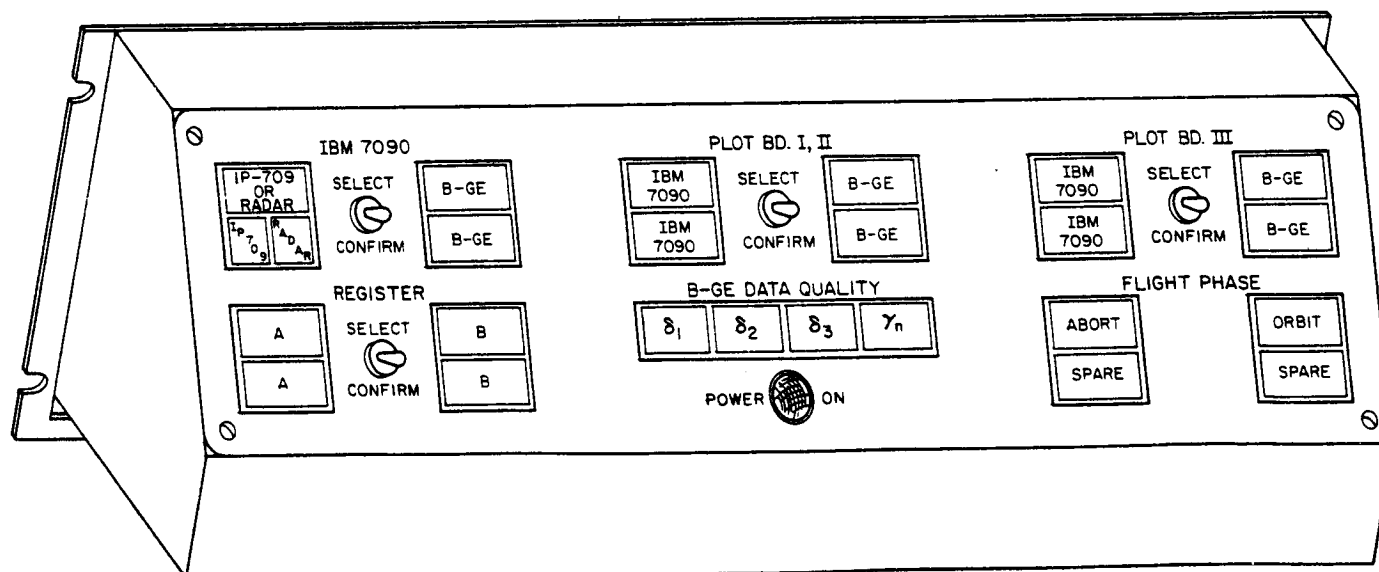


FIGURE 3-1. DQM CONSOLE PANEL

3.3 OPERATING PROCEDURES

This paragraph discusses the general operating procedures for the DQM. However, because the selections made by the operator will depend on the information displayed on the strip chart of the recorder, there are no step-by-step operating procedures.

The operator observes the data displayed on the strip chart of the 8-channel recorder. From this data, he decides which data sources to select. The selections are made by means of switches on the front panel of the DQM console. Descriptions of the function(s) of each control are listed in tables 3-1 and 3-2.

CHAPTER 4

INSTALLATION

4.1 GENERAL

The DQM must be placed so that sufficient clearance is provided to permit the front and rear doors to open and to permit an operator or maintenance man to work unhindered. These conditions and the cabling necessary to make the unit functional are described in this chapter.

4.2 CLEARANCE

The rear door is approximately 24 inches wide. Therefore, the units should be placed in an area which allows free access of at least 24 inches to the rear of the unit.

The front door is also 24 inches; however, this is not a limiting factor when positioning the unit. The console extends 12 inches beyond the front of the unit. Room must also be provided for an operator; therefore, free access of at least 36 inches must be provided at the front of the unit. See figure 4-1 for the allowable limits to be exercised when placing the unit in position.

4.3 CABLING

4.3.1 Power Connections

The power requirement for the DQM is 115v, 60-cycle ac. This power can be obtained at any available utility box, and the unit has a 3-prong twist-lock plug which is used to make the connection. However, if it is necessary to wire this unit directly, the following procedure should be observed:

1. Remove power connections at TBE1101.
2. Connect a 3-wire cable containing two #12 AWG and one #14 AWG wires. See figure 4-2.

4.3.2 Cable Floor Hole

A hole is provided in the bottom of the cabinet to permit all cabling to pass up to the internal connections of the DQM. Because the cabling is routed beneath the floors, the floor hole and the hole in the bottom of the cabinet should be aligned with each other when the DQM is placed in position. The size of the floor hole is determined by the cabling which will pass up through it to the DQM.

4.3.3 Signal Connections

All plugs and cables to the recording system are properly identified by banded markers on the cable ends and by notations on the jacks to which they connect.

The connections to the console are made with spade-terminated wires. Although these wires are a part of a larger cable, they are individually tagged to indicate their connection point on the terminal boards of the console.

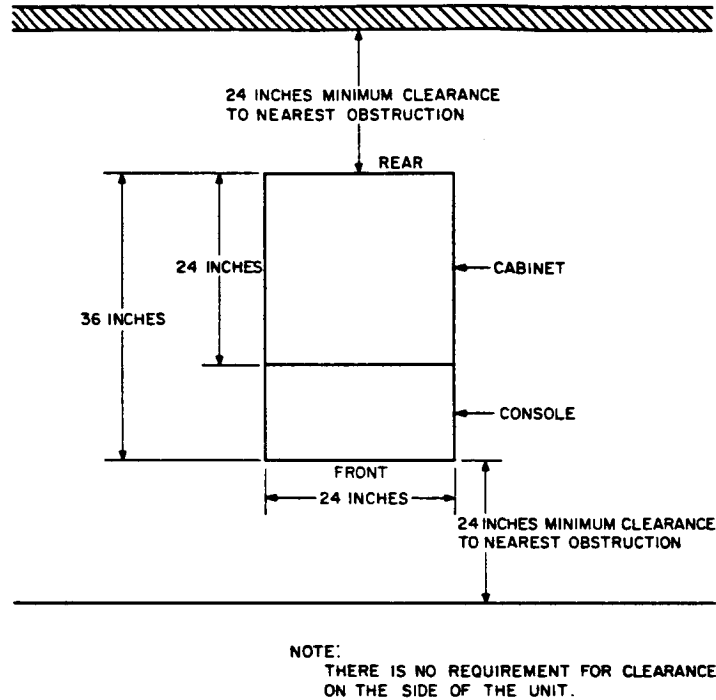


FIGURE 4-1. MINIMUM CLEARANCE REQUIREMENT FOR DQM

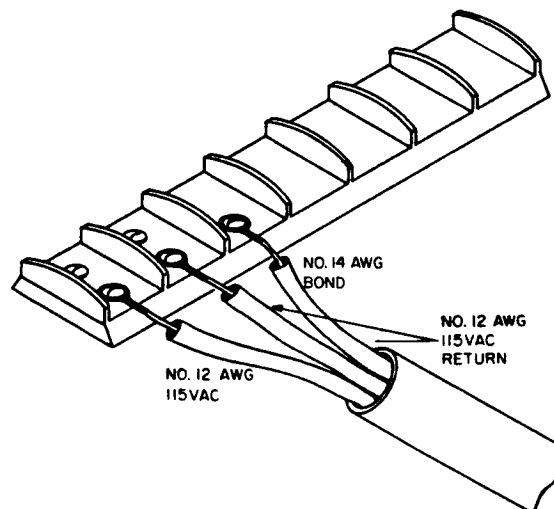


FIGURE 4-2. POWER CONNECTIONS TO TBE1101

CHAPTER 5

MAINTENANCE

5.1 GENERAL

This chapter provides information on component location and test procedures for the DQM. Corrective maintenance procedures and troubleshooting charts are not available at this time but will be supplied at a later date, based on reports from the field.

5.2 COMPONENT LOCATION

Figures 5-1 and 5-2 show the locations of components within the console.

5.3 UNIT TEST

5.3.1 General

There are three parts to unit testing: linearity, power off, and power on. Linearity testing is performed using the DQM Linearity Tester (see Appendix C for panel notation and control functions) which permits checking the DQM quickly and reliably. Basically, the tester is a voltage divider which provides five discrete steps of voltage to be applied to each channel. The power-off tests are a series of continuity tests which check the interlock switch, the control switches, d-c return lines, and common signal lines. The power-on tests are made by measuring the d-c output of the power supply and by testing the operation of the control switches and indicator lights.

5.3.2 Linearity Test

1. Disconnect the eight rear input connections inside the DQM cabinet.
2. The DQM channel amplifiers must be calibrated in accordance with the instruction manual (Appendixes A and B). The styli should be positioned in the middle of each channel by means of the position control associated with each stylus. Adjust stylus heat controls as required. Allow 30 minutes for the recorder to warm up.
3. Connect 50v regulated power supply (isolated terminals) to the two input terminals. Observe polarity. The tester output line should be connected to the ATTN and GND terminals.

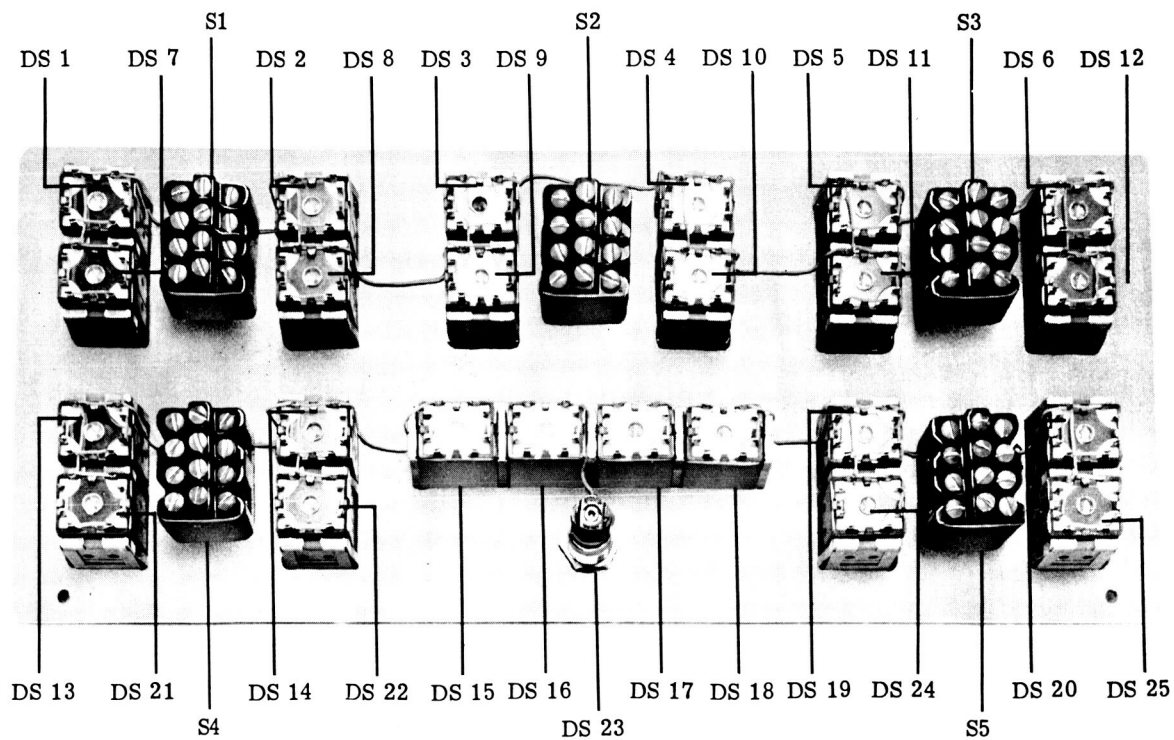
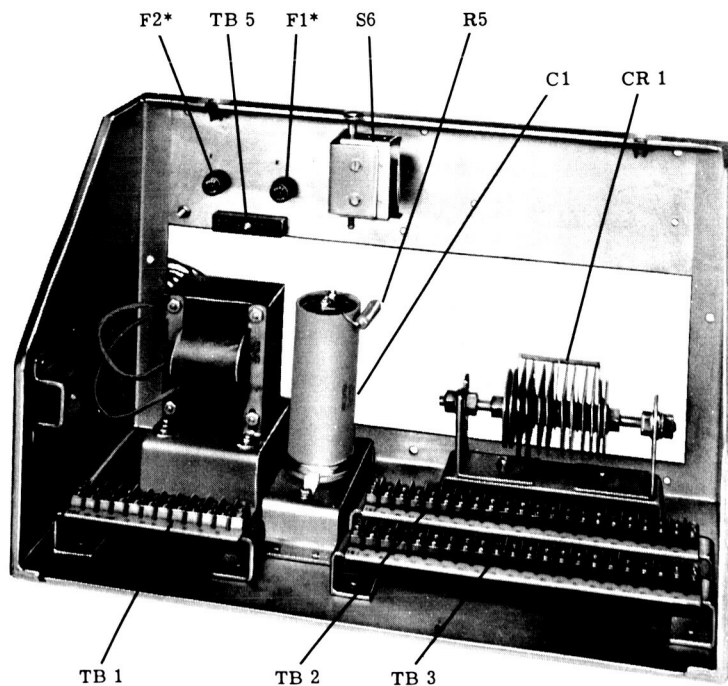


FIGURE 5-1. DQM CONSOLE COMPONENT LOCATIONS, FRONT PANEL



*SPARE PARTS PROVIDED

FIGURE 5-2. DQM CONSOLE COMPONENT LOCATIONS, MAIN CHASSIS

4. Set DQM channel attenuators to 0.2v per division position and the tester switches as follows:

POLARITY to +
DIRECT-ATTEN. to ATTEN
PULSE-LEVEL to LEVEL
ATTEN. STEP to 0

Note

Each accentuated chart line now represents 1v.

5. Plug tester output plug into Channel 1 input jack. Turn on regulated power supply and adjust for 50v output.
6. With recorder chart speed at 5 cm per second, advance tester step attenuator from 0 through 5, pausing at each step to allow sufficient trace to be made. The trace should follow along each division line on the chart. Reverse tester POLARITY switch and repeat. Perform this step for each channel.
7. Set PULSE-LEVEL switch to PULSE and ATTEN. STEP switch to position 5. With recorder chart speed set at 10 mm per second, depress MANUAL PULSE pushbutton until stylus stabilizes at full-scale left. Release pushbutton, reverse POLARITY switch, and depress pushbutton until stylus stabilizes at full-scale right. Release pushbutton. The trace should show the response of the stylus to a full-scale deflection signal of either polarity and should track along the zero axis before, after, and between pulses. Repeat for all channels.
8. Set recorder channel attenuator controls at 2.0v per division and tester DIRECT-ATTEN. switch to DIRECT. The full 50v from the power supply will now be applied to the recorder input. (Handle tester output plug with care.) With the chart speed at 10 mm per second, manipulate POLARITY switch to + and -, and observe full-scale deflection for each channel, in turn.
9. Stop recorder drive, turn off external 50v power supply, and disconnect tester.
10. Restore recorder unit for operational use by reconnecting rear chassis input connectors and setting the recorder front panel controls as follows:

Channel attenuators - 1v/div.
Chart speed - 2.5 mm/sec

Note

When the rear chassis input connectors are engaged, a 1.4:1 attenuator is automatically inserted in each analog input line. This allows the full range of analog input voltage ($\pm 35v$) to be displayed over the full channel width of $\pm 25v$ when the front panel channel attenuators are set to 1v/div.

5.3.3 Power-Off Test

Note

Remove all power from the unit and disconnect the external cable at connector P716 before performing the following checks.

1. Unfasten the two camlock fasteners on top of the DQM and pivot the top-front panel forward.
2. Measure resistance between terminals TB1-a and TB1-d. A reading greater than 10 megohms should be obtained.
3. Depress actuator on interlock switch S6. The resistance reading between terminals TB1-a and TB1-d should be less than 0.5 ohm.
4. Measure resistance between the points listed in table 5-1, and observe resistance reading.
5. Set controls as indicated in table 5-2 and measure resistance as indicated therein.

TABLE 5-1. D-C RETURN, COMMON SIGNAL LINE, AND CONTROL SWITCH CONTINUITY CHECK

Meter Connection Points		Resistance Reading
From	To	
TB1-c C1b P716-0 P716-14 P716-17 P716-21 P716-22 P716-23 P716-3 P716-5 P716-7 P716-4 P716-6 P716-8	Equipment bond or equipment ground	All readings will be less than 0.5 ohm.

TABLE 5-2. SWITCH CONTINUITY CHECK

Switch	Switch Position	Continuity (Less than 0.5 ohm)	Open Circuit (Greater than 10 megohms)
IBM 7090	IP-709 or Radar	TB2-a to P716-9 TB2-c to TB2-d	P716-H to P716-9 TB2-d to TB2-e
	B-GE	P716-H to P716-9 TB2-d to TB2-e	TB2-a to P716-9 TB2-c to TB2-d
PLOT BD I, II	IBM 7090	P716-B to P716-3 TB2-N to P716-L	P716-3 to P716-c P716-K to P716-L
	B-GE	P716-3 to P716-c P716-K to P716-L	P716-B to P716-3 TB2-N to P716-L
PLOT BD III	IBM 7090	P716-D to P716-5 TB2-U to P716-L	P716-L to P716-12 P716-5 to P716-E
	B-GE	P716-L to P716-12 P716-5 to P716-E	P716-D to P716-5 TB2-U to P716-L
REGISTER	A	P716-F to P716-7 TB3-c to P716-L	P716-G to P716-7 P716-L to P716-11
	B	P716-G to P716-7 P716-L to P716-11	P716-F to P716-7 TB3-C to P716-L

5.3.4 Power-On Test

1. Connect 115v, 60-cycle ac to terminal TB1-a, connect return line to terminal TB1-b, and connect equipment bond to terminal TB1-c.
2. Manually activate interlock switch S6 by pulling actuator arm forward.

WARNING

Power is on when the interlock has been bypassed in this manner, and terminals with a maximum potential of 120vac are exposed.

3. Observe that POWER ON indicator is lit.
4. Measure 48 ± 6 vdc potential between terminal C1-a (positive) and C1-b (negative).

CAUTION

Observe correct meter polarity.

Note

During the initial installation of the equipment, 115vac was connected to the transformer (T1) tap (TB5-g through TB5-h) which gave the required 48vdc output. It should not be necessary to change the tap connections unless the a-c input voltages vary from those which were available at the time of assembly.

5. Set control switches to position, and observe condition of indicators in accordance with table 5-3.

Note

All indicators except POWER ON and IBM 7090 CONFIRM have four lamps wired in a series-parallel circuit, with two lamps in each series line. Therefore, if an indicator does not appear to be uniformly lit, it is advisable to check the lamps and make replacements if necessary.

TABLE 5-3. CONTROL SWITCH AND INDICATOR CHECK

Group	Switch Position	Indicator Lit
IBM 7090	IP-709 or Radar B-GE	SELECT IP-709 OR RADAR*
		SELECT B-GE*
PLOT BD I, II	IBM 7090 B-GE	SELECT IBM 7090*
		SELECT B-GE*
PLOT BD III	IBM 7090 B-GE	SELECT IBM 7090*
		SELECT B-GE*
REGISTER	A	SELECT A*
	B	SELECT B*
FLIGHT PHASE	Abort	ABORT *
	Orbit	ORBIT *
	Launch	None

* No other indicator in this group will be lit.

6. To check the Confirm indicators, attach a jumper wire from pin P716-14 to connector pins indicated in table 5-4. The CONFIRM indicators in the Indicator Lit column should light.
7. Remove jumper wire and reconnect all signal and power cables which were removed (par. 5.3.2).

TABLE 5-4. CONFIRM INDICATOR OPERATION CHECK

Connector Pin P716-14 Jumpered to Pin	Group	Indicator Lit
P716-T	IBM 7090	IP-709
P716-U	IBM 7090	RADAR
P716-V	IBM 7090	B-GE
P716-N	PLOT BD I, II	IBM 7090
P716-15	PLOT BD I, II	B-GE
P716-16	PLOT BD III	IBM 7090
P716-P	PLOT BD III	B-GE
P716-13	REGISTER	A
P716-M	REGISTER	B
P716-Y	B-GE DATA QUALITY	δ 1
P716-25	B-GE DATA QUALITY	δ 2
P716-X	B-GE DATA QUALITY	δ 3
P716-24	B-GE DATA QUALITY	T _n

5.3.5 Replacement of Signal Attenuator Resistors

Two attenuator resistors are placed in the input line of each channel of the recorder. These resistors are balanced, and, should one fail, both must be replaced. The replacement resistors must be selected so that the resistance ratio between the 5.6K resistor and the 4K resistor is 4 to 1.

CHAPTER 6

ILLUSTRATED PARTS BREAKDOWN

SECTION 1

INTRODUCTION

1.1 GENERAL

The replaceable assemblies, subassemblies, and detail parts of the console section of the DQM are listed and illustrated in this chapter. The console section of the DQM is manufactured by the International Business Machines Corporation, Federal Systems Division, Kingston, N. Y.

1.2 PURPOSE AND USE

The Illustrated Parts Breakdown is used to obtain replacement parts and subassemblies for the console section of the DQM. A composite exploded view is used to show the disassembly of the consoles. The Group Assembly Parts List (Sect. 2) provides a listing of each part (keyed to index numbers on the exploded view) by part number, description, and the quantity used with each assembly.

For purposes of procurement, any item with a 562-xxxx part number should be referenced with the part number of the overall assembly on which the item is used. IBM Poughkeepsie part numbers are indicated by the suffix P. A No No. entry in the Part Number column indicates that the assembly has no assigned part number.

SECTION 2

GROUP ASSEMBLY PARTS LIST

List and Index No.	Part No.	Description	Unit Per Assy
1-	5203384	Data Quality Monitor Console Assembly. (See fig. 6-1 for illustration.)	REF
-1	3644622	Brace, Control Panel	1
-2	3213150	Screw, Shoulder 10-32	2
-3	3097723	Washer, Flat, No. 10	4
-4	3513021	Nut, Lock, 10-32	2
-5	3105431	Rivet, Alum. Csk Hd	26
-6	3514466	Screw, 8-32	2
-7	3208323	Washer, Lock, No. 8	2
-8	3208112	Washer, Flat, No. 8	2
-9	3208148	Nut, 8-32	2
-10	325678P	Transformer	1
-11	3513862	Screw, 8-32	4
-12	3208323	Washer, Lock	4
-13	3208112	Washer, Flat, No. 8	4
-14	3208148	Nut, 8-32	4
-15	3509825	Fuse	2
-16	3213016	Stud, Cable Support	1
-17	3004089	Cable Clamp	1

List and Index No.	Part No.	Description	Unit Per Assy
1-18	3513862	Screw, 8-32	1
-19	3208323	Washer, Lock, No. 8	1
-20	3208112	Washer, Flat, No. 8	1
-21	3010349	Block, Terminal Taper Pin	1
-22	3208215	Screw, Bind Hd, 4-40	1
-23	3208413	Washer, Lock, No. 4	1
-24	3208377	Washer, Flat, No. 4	1
-25	3208097	Nut, 4-40	1
-26	562-1237	Plate, Rear DQM	1
-27	3109148	Fuse Holder (Post Type)	2
-28	134954P	Capacitor, Electrolytic	1
-29	562-1289	Shield, Intlk Switch	1
-30	3513908	Screw, 6-32	2
-31	3208322	Washer, Lock, No. 6	2
-32	3208073	Washer, Flat, No. 6	2
-33	3004200	Switch, Sensitive Intlk	1
-34	3513908	Screw, 6-32	2
-35	3208322	Washer Lock, No. 6	2
-36	3208073	Washer, Flat, No. 6	2
-37	3004746	Bumper, Intlk Switch	1
-38	134954P	Capacitor Electrolytic	1
-39	3097745	Cable Clamp	1
-40	3513857	Screw, 10-32	1
-41	3000844	Washer, Lock, No. 10	1

List and Index No.	Part No.	Description	Unit Per Assy
1-42	3097723	Washer, No. 10	1
-43	3208140	Nut, 10-32	1
-44	3513020	Nut, Clinch, No. 10	1
-45	562-1288	Board, Comp, 10-Pos	1
-46	3509825	Resistor	4
-47	3091252	Lug, Turret	20
-48	3002409	Insulator	2
-49	3513862	Screw, 8-32	2
-50	3208323	Washer, Lock, No. 8	2
-51	3208112	Washer, Flat, No. 8	2
-52	3208148	Nut, 8-32	2
-53	3513857	Screw, 10-32	8
-54	3208458	Washer, Split, No. 10	8
-55	3097723	Washer, Flat, No. 10	8
-56	316433P	Rectifier, Selenium	1
-57	3514466	Screw, 8-32	1
-58	3208323	Washer, Lock, No. 8	1
-59	3208112	Washer, Flat, No. 8	1
-60	3208148	Nut, 8-32	1
-61	562-1335	Barrier Strip, 20-Pos	2
-62	562-1243	Strip, Marker, 20-Pos	2
-63	3513856	Screw, 6-32	8
-64	3208072	Washer, Split, No. 6	8
-65	3097175	Nut, 6-32	8

List and Index No.	Part No.	Description	Unit Per Assy
1-66	562-1236	Frame, DQM	1
-67	562-1244	Strip, Marker, 10-Pos	1
-68	562-1334	Barrier Strip, 10-Pos	1
-69	562-1322	Shield, 10-Pos Bar Strip	1
-70	3212794	Insulator	2
-71	3513904	Screw, 6-32	2
-72	3208072	Washer, Split, No. 6	2
-73	3208073	Washer, Flat, No. 6	2
-74	3097175	Nut, 6-32	2
-75	3519993	Screw, Csk Hd, 10-32	4
-76	3097186	Washer, Flat, No. 10	8
-77	3000844	Washer, Lock, No. 10	8
-78	3208140	Nut, 10-32	4
-79	3648532	Stud, Cable Support	2
-80	3207216	Cable Clamp	2
-81	3000844	Washer, Lock, No. 10	2
-82	3097186	Washer, Flat, No. 10	2
-83	3208140	Nut, 10-32	2
-84	562-1291	Brkt Conn Mounting	1
-85	562-1337	Connector, 22 Pins	1
-86	3513863	Screw, 8-32	8
-87	3208323	Washer, Lock, No. 8	8
-88	3208112	Washer, Flat, No. 8	8
-89	3208148	Nut, 8-32	8

List and Index No.	Part No.	Description	Units Per Assy
1-90	562-1336	Connector, 52 Pins	1
-91	3513857	Screw, 10-32	4
-92	3000844	Washer Lock, No. 10	4
-93	3097186	Washer, Flat, No. 10	4
-94	3208140	Nut, 10-32	4
-95	562-1238	Panel, Access	Assy
-96	562-1241	Hinge, Piano	1
-97	3097726	Rivet, Flush, 1/8 Dia	5
-98	3513512	Rivet, Flush, 1/8 Dia	2
-99	3512809	Stud, Camlock	2
-100	3003604	Receptacle, Camlock	2
-101	3644622	Brace, Control Panel	1
-102	3213150	Screw, Shoulder, 10-32	2
-103	3097723	Washer, Flat, No. 10	4
-104	3513021	Nut, Lock, 10-32	2
-105	562-1344	Plate, Identification	1
-106	562-1235	Control Panel Marking	1
-107	3509863	Barrier, Mounting Short Side	5
-108	3127692	Indicator Unit, Short Mounting	4
-109	3003208	Lamp, Indicator, 55v	1
-110	3113066	Lamp Holder, Assembly	1
-111	3127686	Lamp, 14v	96
-112	3127694	Indicator Unit, Long, Mounting	20
-113	3509864	Barrier Mounting, Long Side	30

List and Index No.	Part No.	Description	Units Per Assy
1-114	3513936	Screw, 8-32	4
-115	3208112	Washer, Flat, No. 8	8
-116	3513022	Nut, Lock, 8-32	4
-117	4T L1-3D	Micro Switch, Toggle	5
-118	3509861	Display Screen, White	9
-119	562-1257	Label Insert	1
-120	3509859	Display Screen, Green	10
-121	562-1256	Label Insert	1
-122	562-1103	Label Insert	3
-123	562-1316	Label Insert	3
-124	562-1099	Label Insert	2
-125	562-1317	Label Insert	2
-126	562-1105	Label Insert	1
-127	562-1319	Label Insert	1
-128	562-1104	Label Insert	1
-129	562-1318	Label Insert	1
-130	3509857	Display Screen, Red	3
-131	562-1312	Label Insert	1
-132	562-1313	Label Insert	1
-133	562-1314	Label Insert	1
-134	3509858	Display Screen, Yellow	2
-135	562-1315	Label Insert	1
-136	562-1119	Label Insert	1
-137	562-1118	Label Insert	2
-138	562-1117	Label Insert	1

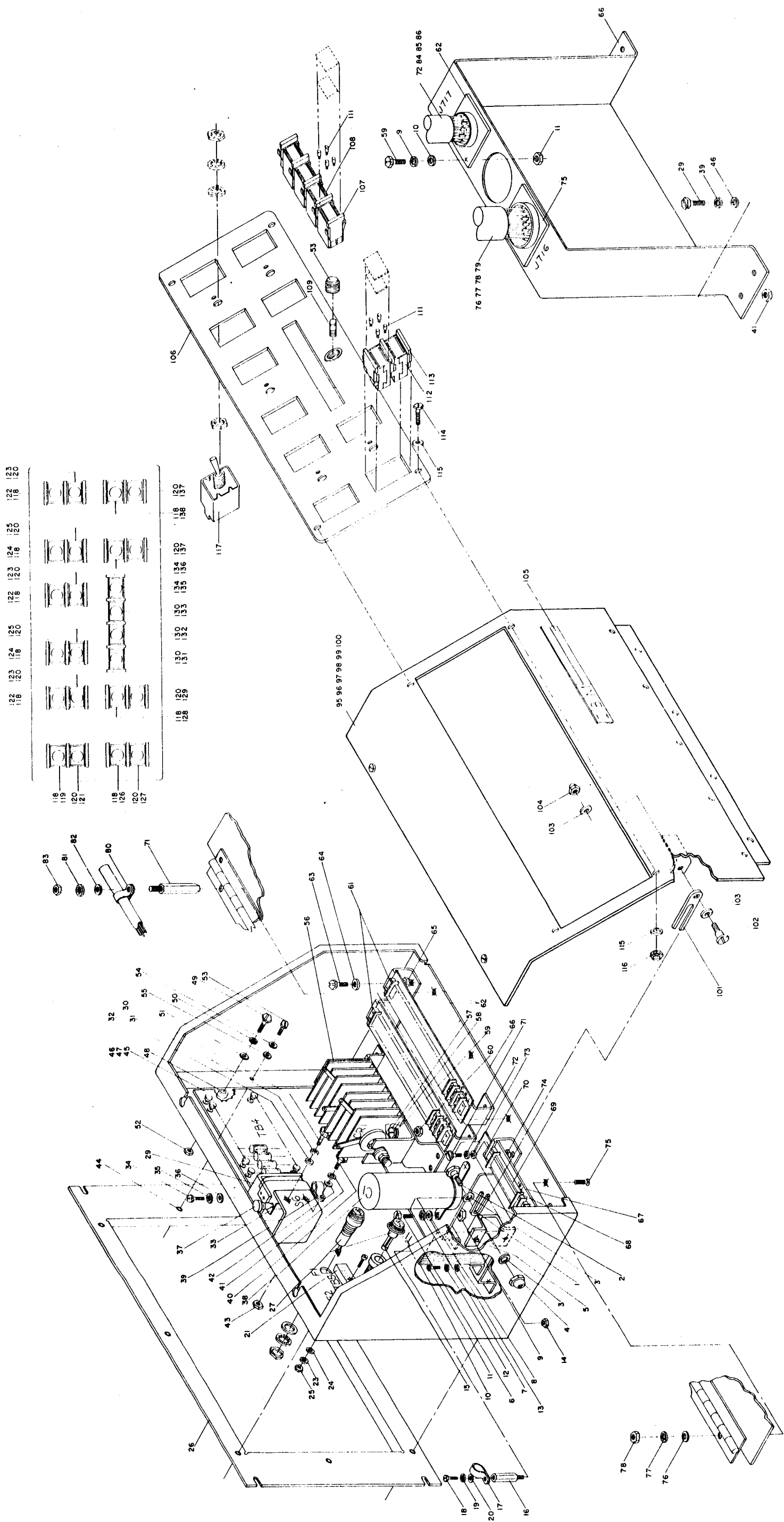


FIGURE 6-1. DQM EXPLODED VIEW

APPENDIX A

SANBORN BASIC RECORDING SYSTEM,
MODELS 350/850, INSTRUCTION MANUAL

Sanborn®

RECORDING SYSTEM

MODELS 356-5480, 358-5480

SANBORN COMPANY

WALTHAM 54, MASSACHUSETTS

IM-356-5480-2

INSTRUCTION MANUAL

RECORDING SYSTEM

MODEL 356-5480

AND

MODEL 358-5480

Sanborn Company

WALTHAM 54, MASS.

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SECTION I
INTRODUCTION AND SPECIFICATIONS

1. INTRODUCTION

The Sanborn Direct Writing Recording Systems Models 358-5480 and 356-5480 record instantaneous permanent records of input variables against a time base. The Systems provide a maximum recording sensitivity of 0.1 volt/div. without the use of Preamplifiers. The difference between the two systems is that the 358-5480 provides eight recording channels and 356-5480 provides six recording channels. Each System consists of a Recorder, 6 or 8 Driver Amplifiers (one for each recording channel), a Power Supply for the Driver Amplifiers, a cabinet and a Control Panel. A combination of the following five instruments make up a System.

CABINET MODEL 358-1100P
RECORDER MODEL 358-100, 356-100N, or 356-100W
DRIVER AMPLIFIER MODEL 350-600B
DRIVER AMPLIFIER POWER SUPPLY MODEL 358-400P or 356-400PW
CONTROL PANEL MODEL 358-600 or 356-600

2. SYSTEM SPECIFICATIONS

These specifications apply to each channel. (They include the Control Panel, the Driver Amplifier and the Galvanometer).

SENSITIVITY:	.1, .2, .5, 1, 2 and 5 volts/div. nominal.
CALIBRATION:	+ 2 volts $\pm 1\%$ internal.
ATTENUATOR ERROR:	$\pm 2\%$ of full scale.
GAIN ADJUSTMENT:	38% to 108% of nominal.
INPUT:	Single-ended 100,000 ohms $\pm 5\%$ input impedance.
ZERO ADJUSTMENT:	$\pm 100\%$, uncalibrated. The stylus may be positioned anywhere on the chart.
DRIFT: (After warmup)	Maximum .25 div/ 10°C temperature change from 20°C to 40°C . Maximum .1 div for line voltage variation from 103 to 127 volts.
GAIN VARIATION:	Maximum 1% with temperature change from 20°C to 40°C and line voltage changes from 103 to 127 volts.
FREQUENCY RESPONSE:	Galvanometer only: Down 3 db at the natural frequency, with 71% of critical damping. Galvanometer and Driver Amplifier: At 10 div. peak-to-peak amplitude, and adjusted to 71% of critical damping, response is from DC to 3 db down at 125 cycles with long writing arms (6-ch. wide recorders) and from DC to 3 db down at 150 cycles with short writing arms (6-ch. narrow and 8-ch. recorders).

SECTION II

DESCRIPTION AND CHARACTERISTICS OF SYSTEM COMPONENTS

1. CABINET MODEL 358-1100P

This is the standard cabinet for either the six or eight channel Recording System. The Cabinet contains the racks for the Recorder and Control Panel, its own control panel which controls the System power, the cooling system and a cable for interconnecting the System.

The controls on the Cabinet Control Panel Model 858-1100-C4 consist of a master power switch, a power indicator light and two 15 amp. fuses. The master power switch (OFF/ON) is the only power control for the complete System.

2. POWER SUPPLY MODEL 358-400P OR 356-400PW

This Power Supply delivers power to the Driver Amplifiers. The Power Supply is mounted at the rear of the Recorder, and six or eight Driver Amplifiers are plugged into it.

Model 356-400PW is used whenever Recorder 356-100W is used. This is the six channel Recorder which cannot be later expanded into an eight channel recorder. As a result the 356-400PW is built to accommodate only six Driver Amplifiers. The Power Supply delivers the following voltages to each Driver Amplifier:

+15 VDC at 100 to 500 ma. unregulated.

-15 VDC at 100 to 500 ma. unregulated.

+12.3 VDC at 0.8 ma. regulated to 1% against line voltage changes.

-12.3 VDC at 0.8 ma. regulated to 1% against line voltage changes.

R441 is adjusted at the factory for exactly -12.3 volts at terminal 1 of J416. R441 is on the regulator sub-assembly just below T401. J416 is the connector on Power Supply into which the regulator sub-assembly plugs.

This adjustment should be checked at maintenance intervals and whenever a Power Supply or regulator sub-assembly component is changed.

3. DRIVER AMPLIFIER MODEL 350-600B

The Driver Amplifier is a transistorized Power Amplifier which receives the input from the Control Panel and changes the signal to a proportional current which drives the galvanometer. The Driver Amplifier receives its operating power from Power Supply Model 358-400P or 356-400PW into which it is plugged.

CHARACTERISTICS

SIGNAL INPUT:	Single-ended, 500K ohms minimum.
POSITION INPUT:	Single-ended, approximately 7K ohms.
SENSITIVITY:	100 mv/div. ± 2.5 volts to reach chart edge from chart center.
RATED OUTPUT:	Full scale corresponds to ± 400 milliamperes through an ungrounded 17.5 ohm load. Output resistance is approximately 2000 ohms.
OUTPUT LINEARITY:	Within .1% over ± 400 ma.
ELECTRICAL LIMITING:	Approximately $\pm 115\%$ of full scale.
FREQUENCY RESPONSE:	(Without equalization but with high frequency stabilization network). 0-20KC within 3 db. at five volts rms., measured across 17.5 ohm resistive load which may be shunted by up to 0.1 mfd.
FREQUENCY RESPONSE:	(With equalization). 0-10 cps., essentially flat, rising to +7 and then to +17 db. as adjusted at 150 cps. Ultimate boost approximately 30 db. Galvanometer damping is adjusted for optimum response, typically about 115% of critical damping. Recording system response is then flat to 150 cps. within 3 db.
SOURCE RESISTANCE:	Signal source resistance must be less than 10,000 ohms, to avoid baseline shift when switching between the X1 and X2 ATTENUATOR positions.

ADJUSTMENT

This adjustment is done at the factory and need be readjusted only when the Driver Amplifier is changed or when a Driver Amplifier component is changed.

To adjust:

- a. Determine which writing arm is being used, and find the associated test frequency and test amplitude from the table below:

<u>Model</u>	<u>Writing Arm</u>	<u>Test Frequency</u>	<u>Test Amplitude</u>
350-600B	short	125 c. p. s.	9 mm.
350-600B	long	125 c. p. s.	7 mm.

- b. Connect a sine wave oscillator to the Control Panel input. Set signal frequency to ten cycles, paper speed to 5 mm./sec., maximum usable stylus heat, and adjust the signal and/or sensitivity for 10 mm. peak-to-peak deflection, centered about the chart center. Galvanometer damping control and Driver Amplifier equalization control should be set at approximately the center of their ranges.

ADJUSTMENT (Continued)

- c. Now, keeping the oscillator amplitude constant, raise the oscillator frequency to the test frequency given in table above. Use the Driver Amplifier equilization control to set the peak-to-peak chart deflection to the test amplitude given in the table.
- d. Reduce oscillator frequency to 55 cycles/second. Adjust galvanometer damping control for 10 mm. peak-to-peak deflection.
- e. Return oscillator frequency to ten cycles/second. Change the signal level and/or sensitivity to obtain 10 mm. peak-to-peak deflection again. Now repeat steps c and d for readjustment as needed.

4. CONTROL PANEL MODEL 358-600 AND 356-600

This Panel controls the six or eight recording channels. It has on its front panel three controls and a signal input jack for each channel. At the Control Panel rear is a signal input for each channel. The rear inputs are accessible by opening the Cabinet rear door.

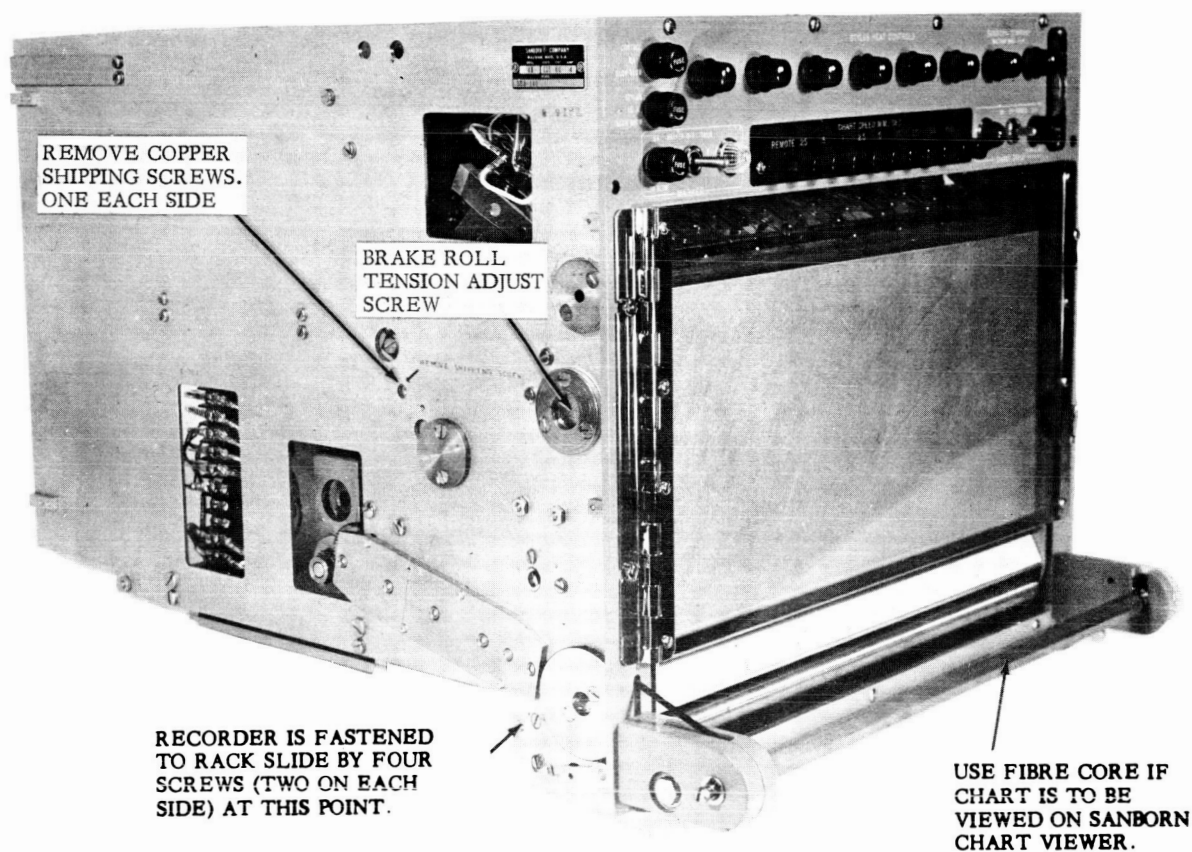
The Control Panel controls are:

- V/DIV: An eight position switch offering six sensitivities, a CAL position and an OFF position.
The sensitivities are: .1, .2, .5, 1, 2 and 5 volts/div. nominal.
The CAL position provides an internal calibration signal of +2 volts $\pm 1\%$ for calibration purposes.
- SENSITIVITY: Adjust the gain of the channel to the nominal sensitivity of 100 millivolts/division.
- POSITION: Adjusts the stylus position on the chart.
- INPUT: Single-ended input jack for input signal.
- REAR INPUT: Two pin connector for input signal. Pin 1 is for the signal.
Pin 2 is grounded.

The two transistors on the Control Panel regulate the positioning voltages (positive and negative 12 volts).

5. CALIBRATION PROCEDURE

- a. An accurate +2.0 volt DC source, single ended to ground is required.
- b. Set the RANGE switch on the front panel to the maximum sensitivity 0.1 V/mm.
- c. Connect the +2.0 volts DC to the channel under test and adjust the SENSITIVITY control for exactly 2.0 cm. deflection on the paper.
- d. Now turn the RANGE switch to the CALIBRATE position. This applies a +2.0 volt signal internally to the circuit. The deflection should be the same as that appearing with the external +2.0 volts applied to the circuit. If the deflection is not the same, adjust R441 (miniature pot) of the Voltage Regulator Card Model 358-400-C4. The Voltage Regulator Card is plugged into J416, at the bottom center of the power supply, mounted on the rear of the Recorder.



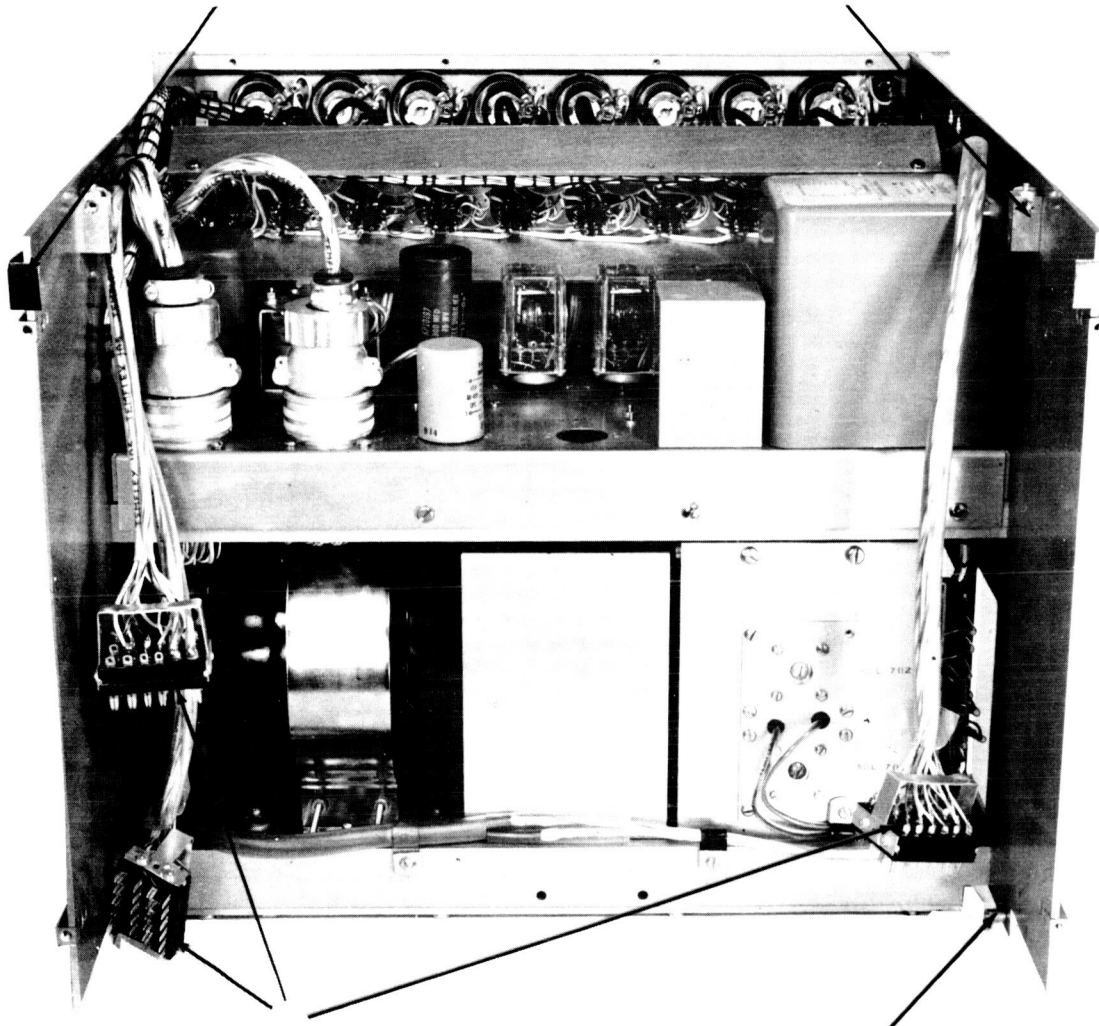
SANBORN 350 STYLE RECORDER

6. RECORDERS MODELS 358-100, 356-100N AND 356-100W

The Sanborn Six or Eight Channel Recorders Models 356-100N, 356-100W and 358-100 are used in the Recording Systems. These direct-writing, oscillographic recorders make instantaneous permanent records of input variables against a time base.

RETAINER, WHEN
POWER TRANSFER
CHASSIS IS
UNSCREWED FROM
RECORDER

TRANSFER CHASSIS
HOOKED & ATTACHED
HERE



POWER TRANSFER
CHASSIS CABLES

POWER TRANSFER
CHASSIS PIVOTS
HERE

SANBORN 350 STYLE RECORDER

6. RECORDERS MODELS 358-100, 356-100N AND 356-100W (Continued)

In each channel, a galvanometer moves a heated stylus over the plastic-coated Sanborn Permapaper as the paper is drawn over a sharp edge platen. The Permapaper has rectilinear co-ordinates for time reference and amplitude reference. As the Permapaper is drawn over the platen at a constant speed, the stylus moves over it in proportion to the input signal voltage level and frequency, making permanent recording of the input waveform.

A. THE SANBORN PERMAPAPER CHART

Six-Channel Recorder Model 356-100W records six channels of information. Each channel on the Permapaper is five centimeters wide.

Six-Channel Recorder Model 356-100N and Eight Channel Recorder Model 358-100 record six or eight channels of information respectively on Permapaper channels which are four centimeters wide.

The four centimeter and the five centimeter wide channels are divided into fifty divisions. For calibration purposes, the divisions on the four centimeter wide Permapaper may be considered full millimeters or centimeters.

The Six-Channel Recorder Model 356-100N can be modified to become an Eight-Channel Recorder.

The vertical, or transversal, co-ordinates are for time reference. They are continuous from margin to margin over the six or eight channels so that the timing of events in any of the channels may be studied in relation to one another. Fifth lines are accentuated, and heavy lines in the spaces between channels mark 100 millimeter intervals.

Non-critical (off-on) information such as timing, marking and reference coding pulses may be recorded in the Permapaper margins. A standard marker for timing and marking writes in the right margin.

The Sanborn Permapaper comes in 200 foot rolls. It has either 4 cm. or 5 cm. wide channels.

Identification and notes may be written directly on the Permapaper with ballpoint pen, pencil, or fountain pen. Special points of interest may be called out by marker traces recorded either manually by the TIME/OFF/MARK switch, or remotely thru the proper connection. Sanborn Multimarkers Model 199 may be installed in any or all channels to provide special marking facilities.

A. THE SANBORN PERMAPAPER CHART (Continued)

The paper drive motor is a synchronous, 1800 rpm, 1/12 hp. electric motor. This motor maintains a constant speed so long as the power line frequency is constant and there is no unreasonable overload.

There are nine paper speeds: 100, 50, 25, 10, 5, 2.5, 1.0, 0.5, and 0.25 mm./sec. Paper speeds are selected by pressing the appropriate button. Electrically operated clutches select the required combination of gears.

B. GALVANOMETER

Recording is done by moving-coil galvanometers having separate permanent magnets. Plastic covers prevent entry of foreign matter into the movement. The coil has two windings: the outside winding carries feedback voltages which are applied to the power amplifier for damping; the inside winding carries the signal currents.

CHARACTERISTICS:

Sensitivity:	16 ma./div. (0.031") deflection for narrow paper. 16 ma./div (1 mm) deflection for wide paper.
Rise Time:	The time to reach 90% of final deflection when the galvanometer is critically damped is 7 milliseconds.
Natural Frequency:	55 cps. with short stylus. 45 cps. with long stylus.
Frequency Response:	The frequency response of the galvanometer damped 70% of critical is 3 db. down at its natural resonant frequency.
Damping:	Source impedance for critical damping is 3 ohms. This is supplied by the Driver Amplifier whose output impedance is controlled by the velocity feedback voltage from the feedback winding. Feedback is adjustable over a damping range from 60% to 110% of critical damping.
Linearity:	The deflection vs. input current characteristic is linear within ± 0.25 division.
Hysteresis:	Previous signals do not affect the trace more than 0.15 division.
Torque:	250,000 dyne centimeters developed by 160 ma. for a 10-division deflection.

Coil Resistance:	Signal winding: 15 ohms cold, 17.5 ohms hot. Feedback winding: 15 ohms.
Flux Density:	8000 gauss minimum in air gap between poles.
Writing Arm:	Sanborn Number 398, long, for use with wide channel recorder. Sanborn Number 399, short, for use with narrow channel recorder.
Drift:	Less than 0.1 volt equivalent input.

C. CONTROLS AND INDICATORS

The following controls and indicators are on the recorder panel:

STYLUS HEAT:	Each control determines the heat of the stylus writing in the channel directly below it. Optimum setting of each control depends on the writing speed required by the input variable. Accordingly, set each control for best trace appearance when setting up system. Once adjusted at any paper speed, the trace density will remain the same at other speeds because the paper speed shift automatically adjusts the stylus heat in proportion to the change in speed.
MOTOR:	This switch starts and stops the paper drive. In the ON position it switches power to the paper drive motor and appropriate stylus heat circuits. In the OFF position, power is disconnected from these circuits except that a small amount of stylus heat is applied to prevent the styli from sticking to the Permapaper. In the REMOTE position, start-stop control is transferred to a remote control.
PAPER FOOTAGE INDICATOR:	The recorder holds 200-foot rolls of Permapaper. As Permapaper is used the indicator shows red. The figure opposite the end of the red section indicates in feet the amount of Permapaper left.
TIME/OFF/MARK:	TIME position provides a mark at the rate of a pulse per second in the right margin which continues until the switch position is changed. MARK position provides a single pulse which continues as long as the switch is held to MARK.
PAPER SPEED:	Pushing the appropriate button selects the desired paper speed. The REMOTE button switches control to a remote circuit. Paper speeds may be changed while the paper drive motor is either off or running. When all buttons are out the paper runs through at 0.25 mm./sec.

SANBORN PERMAPAPER

	Eight Channel Sanborn No.	Six Channel Wide Sanborn No.	Six Channel Narrow Sanborn No.
Green Coordinates on Opaque White Background	651-58	651-57	651-56
Black Coordinates on Opaque White Background	651-48	651-47	651-46
*Orange Coordinates on Translucent White Background	651-188	651-187	651-186

*** Suitable for making Ozalid reproductions**

SECTION III

MAINTENANCE

1. REPLACING THE CABINET AIR FILTER

To replace the filter Sanborn Number 358-1122, remove 3 knurled screws.

Lift the grill and pull the bottom out and away from the frame.

Pull out the filter.

Install new filter by reversing the above procedure.

2. LUBRICATION

Experience has shown that more attention must be paid to the lubrication of Sanborn Systems.

Check and lubricate the blower motor at least every 3 months with Sanborn Recorder Lubricant 39LU-8 oil. For 24 hour a day operation more frequent checks should be made. Oil cups are on both ends of the motor and are accessible by removing the two chrome-plated metal plugs located on the top cover of the blower case. Do not use rust prevention or cleaning oils.

Do not over-lubricate. Wipe up overflows or spills.

Lubricate the paper drive motor at least every 3 months with Sanborn Recorder Lubricant 39LU-8 oil or SAE 10 electric motor oil. For 24 hours a day operation more frequent checks should be made. Oil cups are on both ends of the motor, above each bearing, and may be reached through front of Recorder. DO NOT use rust prevention or cleaning oils.

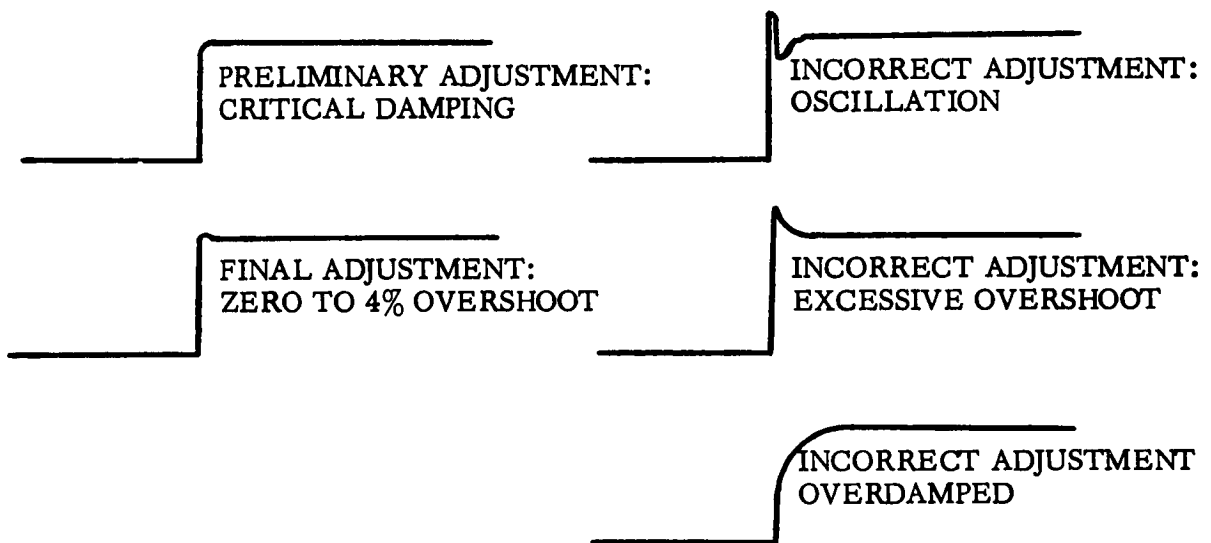
The gear box should be lubricated every 3 months or every 500 hours. Lubricate as follows: oil all visible oilite bearings with Lubricant 39LU-8 oil. Oil between every gear. Apply moderate amount of Lubricant 39LU-7 grease on gear teeth.

At least once a year lower platen table and remove Permapaper to lubricate gears along left wall of Recorder with Sanborn Recorder Lubricant 39LU-7.

Lubricate drive chains with Anderol L-732 or equivalent every 500 hours. (Every 3 months). Remove chrome covers directly behind Paper Supply Spindle. Check and clean chain. Use a sash brush to apply lubricant to chains.

3. DRIVER AMPLIFIERS AND POWER SUPPLY

There are no routine maintenance adjustments for the Driver Amplifiers and Power Supply. Failure of their component parts is rare. Any trouble originating in the Driver Amplifier is usually caused by the transistors. This can be eliminated if the warnings about operating the recorder in the extended position or blocking the flow of air are heeded.



DAMPING CONTROL ADJUSTMENT

4. RECORDER

The recorder may be pulled forward 7 1/2 inches for access to the recording compartment. Pull up on the two latches on each side of the bottom of the recorder front panel, underneath the paper take-up posts. Holding the latches up, pull the recorder toward you as far as it will go.

Do not operate the system continuously with the recorder extended. To do so blocks the circulation of air within the system; this is detrimental to its operation.

To replace the recorder in its normal operating position simply push it into the cabinet. The latches will lock it automatically.

The following paragraphs are Recorder Maintenance.

5. ADJUSTING THE DAMPING

Pull the recorder out to its maintenance position. The screwdriver-adjusted controls on the transfer chassis above the galvanometers are the damping controls.

Calibrate the channel for a 10-division deflection. Record a series of square waves with the calibration signal. Adjust the damping control for a square wave having a sharp upper corner leading edge, with a slight overshoot not exceeding 4% of the amplitude (1/2 division). The square wave must be neither overdamped (round corner) nor underdamped (spiked corner). If the damping adjustment does not give the desired result, adjust the damping and equalization controls as described in Section II, paragraph 3.

6. REPLACING WRITING ARMS

Pull the recorder forward to its maintenance position. Open the record-viewing window. Lower the paper table.

Loosen the writing arm clamping screw which holds the writing arm in place. Be careful that magnetic-pull does not cause the screwdriver to damage the galvanometer.

Lift the writing arm clear of its clamp.

Insert the replacement writing arm in the clamp. Be sure it is seated properly over the clamp screw; push it down gently but firmly as far into the clamp as it will go.

Tighten the clamping screw.

7. CORRECTING AN INDISTINCT BASELINE

Record traces may blur after the recorder has had considerable use. Before taking steps to correct this condition, check trace definition by turning the STYLUS HEAT control over a wide range. Check writing arm clamping screw, it should be tight.

If a better STYLUS HEAT control position cannot be found, turn off the power and perform the following adjustments.

Remove the writing arm producing the faulty trace and examine the surface of the hot-wire stylus. If the stylus is dirty, clean it by scraping it gently with a sharp blade or rub it carefully with fine sandpaper. Do not use steel wool or abrasives containing metal particles. If the ribbon is bent, straighten it carefully with tweezers. Replace the writing arm and check the trace.

If the trace is still not satisfactory check the stylus force on the paper with Stylus Pressure Tester Model 442. If stylus force needs to be increased, remove the writing arm and carefully bend the rods slightly near the mounting base to lower the stylus by 1/16 inch. Replace the writing arm and check the trace.

If the trace is still not satisfactory, try the preceding steps once more. Discard the writing arm if they fail.

If a new writing arm makes a faulty trace, check to see that it is properly installed and that it was not damaged in installation.

If all or most of the traces are blurred, check the Permapaper as it passes over the platen at the top of the paper table. There should be no sign of looseness; the paper should be taut as it passes over the platen so that the stylus has as sharp and small a surface as possible on which to write. Adjust the paper brake for optimum paper tension.

8. REPLACING THE GALVANOMETER COIL HOUSING AND CAP ASSEMBLY

The Galvanometer Insert is the coil, coil housing and bakelite cap which fits inside the magnet. This assembly is Sanborn Number 606. To replace it, turn the power off, pull the recorder out to its maintenance position, and proceed as follows:

Remove writing arm.

Unplug galvanometer cable. Disconnect the cable from the galvanometer.

8. REPLACING THE GALVANOMETER COIL HOUSING AND CAP ASSEMBLY (Continued)

Adjust the magnetic shunt for maximum shunting. The magnetic shunt is the bar mounted on the left side of the magnet pole pieces. Turn the adjustment on the front end of the shunt (use a screwdriver with a 1/4 inch blade or 5/16 inch hexagonal wrench) until you can see the shunt block the three holes in the side of its case. In this position, the shunt acts as a keeper for the magnet; failure to perform this step before removing the galvanometer housing weakens the magnet.

Remove the two screws which hold the housing to the magnet. Each screw is about an inch from the writing arm clamp; one screw is directly in front of it, the other directly behind it.

Lift the galvanometer housing straight out of the magnet. Wrap the assembly for shipment as soon as possible, using the shipping tube in which its replacement was shipped, or packing adequate to protect the coil which is now exposed.

Before installing the replacement housing, clean the surfaces of the pole pieces with a clean, dry, lintfree cloth to remove any metallic particles.

Insert the replacement housing into the magnet; replace, but do not tighten, the two screws which secure the assembly. Connect the cable. Plug the connector into the socket.

Replace the writing arm. Carefully rotate the galvanometer housing to place the stylus on the chart center line; there is a slight amount of play in the galvanometer housing to allow for this adjustment. When the galvanometer housing is correctly aligned, tighten the two screws which secure the housing to the magnet.

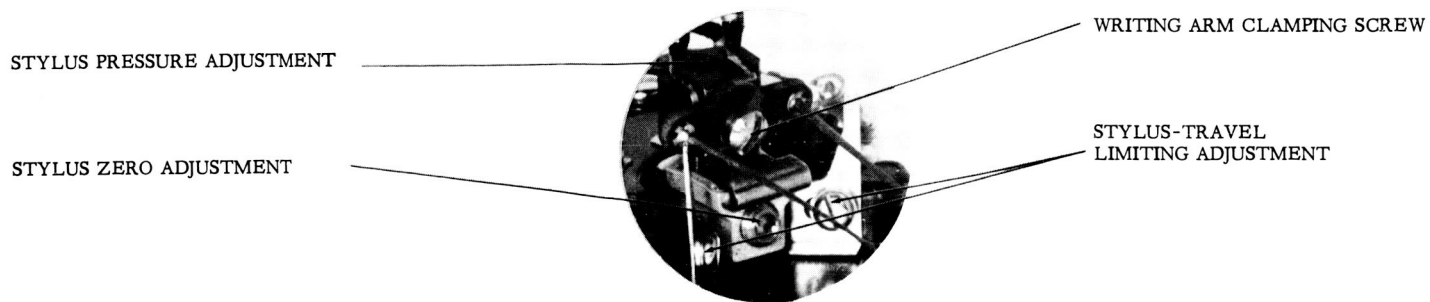
Turn the recorder on and adjust the magnetic shunt, see paragraph 9 Adjusting the Magnet Shunt.

9. ADJUSTING THE MAGNET SHUNT

The magnet shunt should be adjusted after any major repair work is done on the galvanometer. The shunt is on the left side of the galvanometer pole pieces. Use a 5/16" hexagonal wrench or a 1/4" blade screwdriver.

Calibrate the adjacent channel for a 10-division deflection. Unplug the adjacent galvanometer and plug the galvanometer to be adjusted into the adjacent channel connector.

Without disturbing any of the amplifier settings, press the adjacent channel CAL button and adjust the magnet shunt for a 10-division deflection. This procedure makes the sensitivities of the galvanometers equal. Connect each galvanometer to its channel. Check damping of newly-adjusted galvanometer.



GALVANOMETER INSERT
606

SHUNT BLOCK 158-1005
SHUNT STEP BLOCK 158-1004
COVERSHUNT 158-1007

CABLE, GALVY
CONNECTOR 10G11-1MWL
(Order Separately)

GALVY SHIELD
358-1007
(Order Separately)

STYLUS NO. 399 FOR 4cm PAPER.
NO. 398 FOR 5cm PAPER
(Order Separately)

HOUSING SCREW

POLE PIECE

SHUNT ADJUSTMENT ASSEMBLY

MAGNET
151-1001

GALVY ADJUSTING PLATE
158-1003P1
(Order Separately)

SANBORN GALVANOMETER MODEL 607
WITH GALVY ADJUSTING PLATE,
GALVY SHIELD, CABLE AND STYLUS

10. ADJUSTING THE PAPER BRAKE

The paper brake is the black rubber roll behind the platen table. It is visible when the platen table is lowered. It determines the tautness of the Permapaper by providing drag against which the paper drive works.

Braking is adjusted by turning the brake spring retainer clockwise to increase tension, or counterclockwise to decrease tension.

Pull the recorder out to its maintenance position. Identify the adjustment which is on the left side of the recorder, by looking at the drive roll for orientation; its left hub is slotted for screwdriver adjustment.

The criterion for proper paper brake drag adjustment is the shape of the Permapaper as it passes over the writing platen. Tension should not be so low as to make the paper curve as it passes over the platen, exposing more area to the heated stylus than is consistent with clear, sharp traces, nor should the paper be so taut as to risk tearing. Accordingly, after locating the adjustment, lift the paper table to its normal operating position, and lock it in place, run the paper drive at 50 mm./second, and adjust the paper drag brake tension for sharpest traces.

11. CLEANING THE PAPER BRAKE ROLL

Clean the paper brake roll after using ten rolls of Permapaper, or every six months, or whenever the roll appears to need cleaning. Clean the roll with an organic agent.

Recommended:

Rub-R-Vive
made by
Schwartz Chemical Company
326-328 West 70th Street
New York 23, New York

FO-128
made by
Fine Organics, Inc.
211 East 19th Street
New York 3, New York

SECTION IV OPERATION

1. INSTALLATION OF SYSTEM

The recorder, galvanometers, paper drive motor chain and stylus guard retainer are held in place during shipment to prevent damage. Open the cabinet door and remove the four copper screws which hold the recorder to the cabinet shipping brackets. At the recorder front, remove the two copper screws (one on each side toward the recorder top) which hold the recorder to the cabinet front. Pull up on the two recorder locks on each side of bottom of the recorder front panel and pull the recorder toward you as far as it will go. Remove the two copper screws (one on each side of the recorder) and then push the recorder back into the cabinet. The locks will close automatically. Open the recorder viewing window by pulling the two latches toward each other to unlock it, and pulling it open to the left. A stylus guard retainer is taped to the platen table. Remove it. Replace on shipment. Unlock the platen table by pulling out the platen table lock on the lower left side of the platen table. Rotate out and up the table lock to free the platen table and carefully lower the platen table to its resting position. Lift the Permapaper spool out of the recorder. Look in through the paper compartment and identify two chrome plate plug buttons. Pry out the right hand button. It holds the motor chain in place. Replace with button supplied as an accessory. Replace the Permapaper spool and close and lock platen table and viewing window.

Move the System to its operating location. Do not obstruct the air filter.

Check that the power available for the system is at the right voltage and frequency. The voltage may vary between 105 and 130 volts with no effect on the accuracy of the recording. Line frequency should be exactly on its rated value if there is to be no time-axis error in the final recording.

No elaborate leveling procedures are required for the system.

2. CHECKING THE SYSTEM (After all shipping screws etc. have been removed)

Set the MASTER POWER switch to OFF and connect the system to the power line with the furnished heavy duty line cord. Ground the cabinet through the grounding lead at the male end of the cord. Set the MASTER POWER switch to ON and listen for the blower. If you cannot hear the blower, check it by placing a sheet of paper in front of the air filter and look for the suction effect caused by the air passing through the system. If the blower is not functioning, turn the system OFF immediately and investigate the trouble.

Get acquainted with the system using this manual before starting operations.

3. OPERATION OF SYSTEM

Experience will show the most convenient operating procedure for any recording problem. The procedure outlined below is a series of suggested basic steps to be followed in making the record.

- a. Do not operate the system continuously with the recorder extended. This blocks the circulation of air within the system.
- b. Turn the MASTER POWER switch to ON and allow the system ample warm-up time. Be sure the cabinet blower is operating.
- c. Calibrate the channels as follows: Center the styli on the chart with the Control Panel POSITION controls. Rotate the Control Panel V/DIV switches between OFF and CAL and adjust the Control Panel SENSITIVITY controls for 20 div. deflections. The channels are now adjusted to their nominal sensitivities of 100 mv./div.
- d. Check the Permapaper supply.
- e. Apply the input signals to the Control Panel. Run the recorder at any paper speed. Turn the motor switch to ON, advance the Control Panel V/DIV switch for the desired sensitivity and adjust the recorder stylus heat control for best trace appearance.
- f. Select the paper speed for recording.
- g. To start recording, turn recorder MOTOR switch to ON. Mark and time recording as desired.
- h. To stop recording, turn MOTOR switch to OFF.
- i. For operation from a remote location, switch circuits to REMOTE, and see REMOTE OPERATION, paragraph 4.

4. REMOTE OPERATION

The following operations may be performed from a remote point:

- Select paper drive speed
- Start and stop paper drive
- Mark records

Remote connections are made to the recorder through J412 on the Driver Power Supply. A connector is supplied with the instrument.

Remote controls operate from a 24 volt source in the Driver Power Supply. Remote switching involves returning the 24 volts to the appropriate circuits. The +24 volt point is terminal 14 of J412.

4. REMOTE OPERATION (Continued)

Marker: The marker return is terminal 1. Connect terminals 1 and 14 to a SPST switch; close switch to mark.

Paper Drive Start-Stop: The paper drive return is terminal 3. Connect a SPST switch to terminal 14 and 3; close switch to start, open to stop.

Speed Selector: Terminals 8, 9, 10 and 11 are the returns to the speed control relays. Return terminal 14 to the terminals indicated in the table below.

<u>Speed (mm. /sec.)</u>	<u>Return to terminals</u>
100	8, 9, 10 and 11
50	9, 10, and 11
25	10 and 11
10	8, 9 and 11
5	9 and 11
2.5	11
1.0	8 and 9
0.5	9
0.25	open

5. REMOVING THE RECORD

To remove the record:

Cut Permapaper between paper take-up and recorder.

Push take-up latch toward recorder panel.

Lift right end of take-up spindle.

Use both hands as spindle will slide out of roll.

Lift paper take-up spindle off and away from recorder. Remove record.

Replace empty take-up spindle on recorder. Lock it in place by pulling latch toward you.

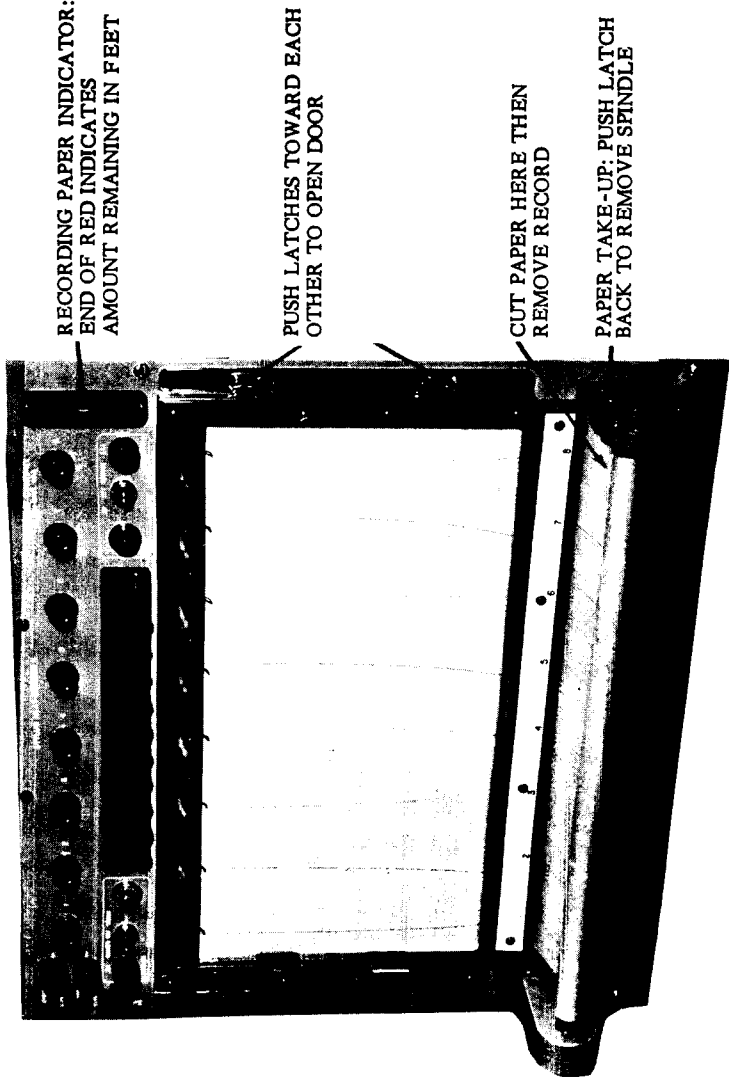
NOTE: If record is to be viewed on Sanborn Chart Viewer the hexagonal fibre core must be placed on Paper Take-Up spindle.

6. INSTALLING PERMAPAPER

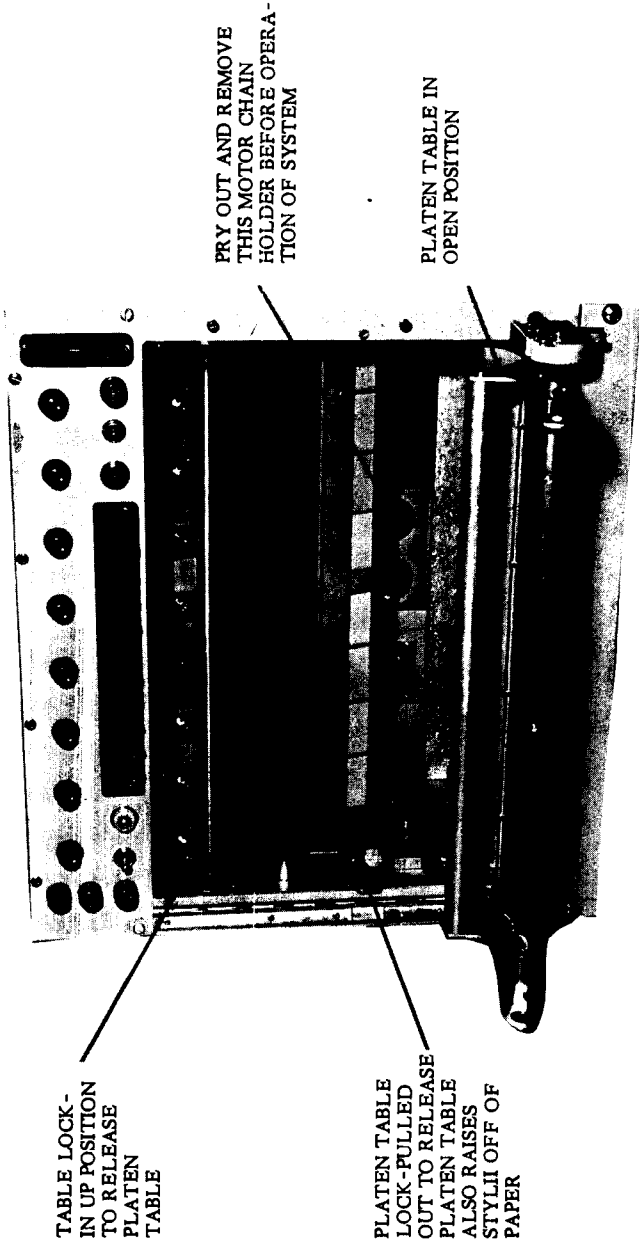
a. Open the record viewing window by pushing the two latches toward each other to unlock it, and pulling it open to the left.

b. Unlock the platen table by pulling out the platen table lock on lower left side of platen table.

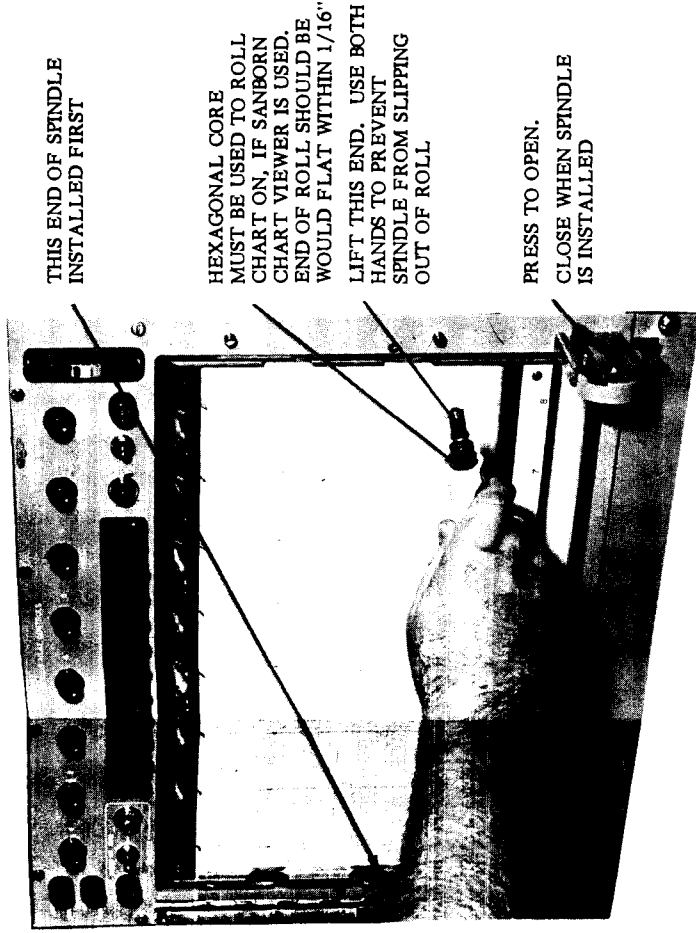
c. Rotate out and up the table lock. Hold hand against platen table and carefully lower to its resting position.



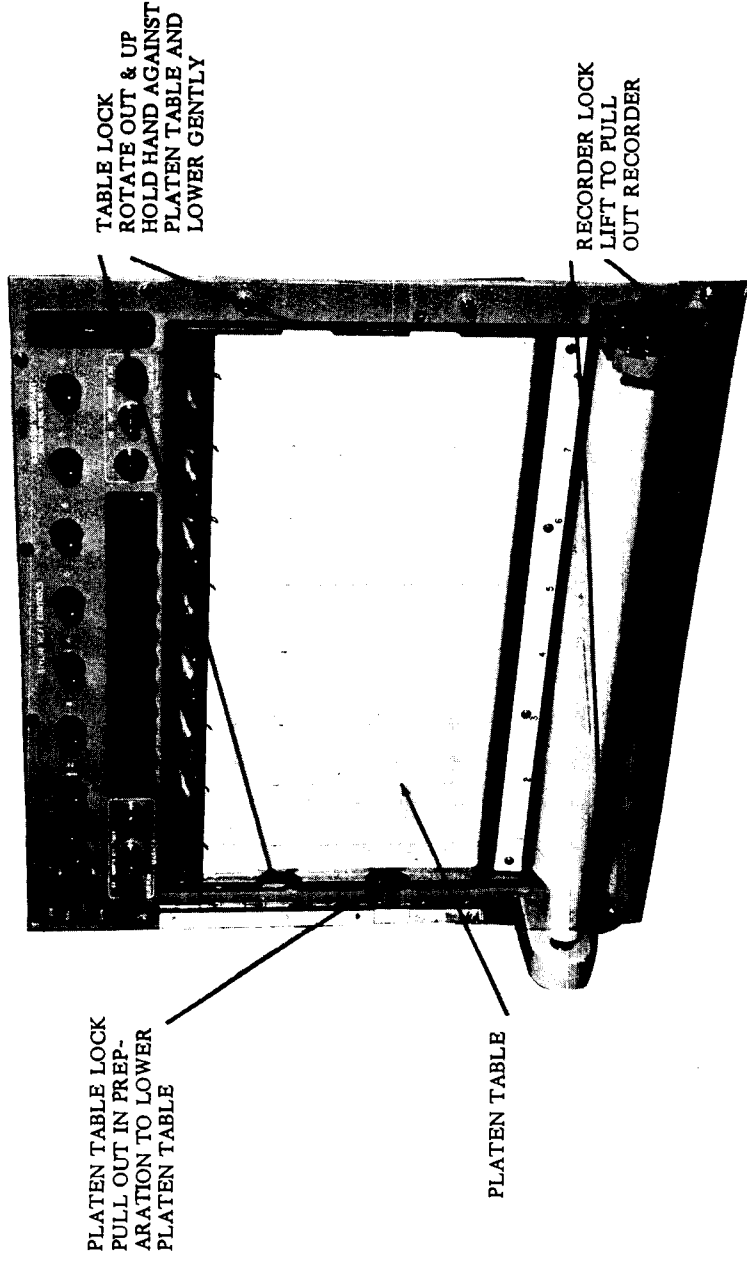
SANBORN 350 STYLE RECORDER



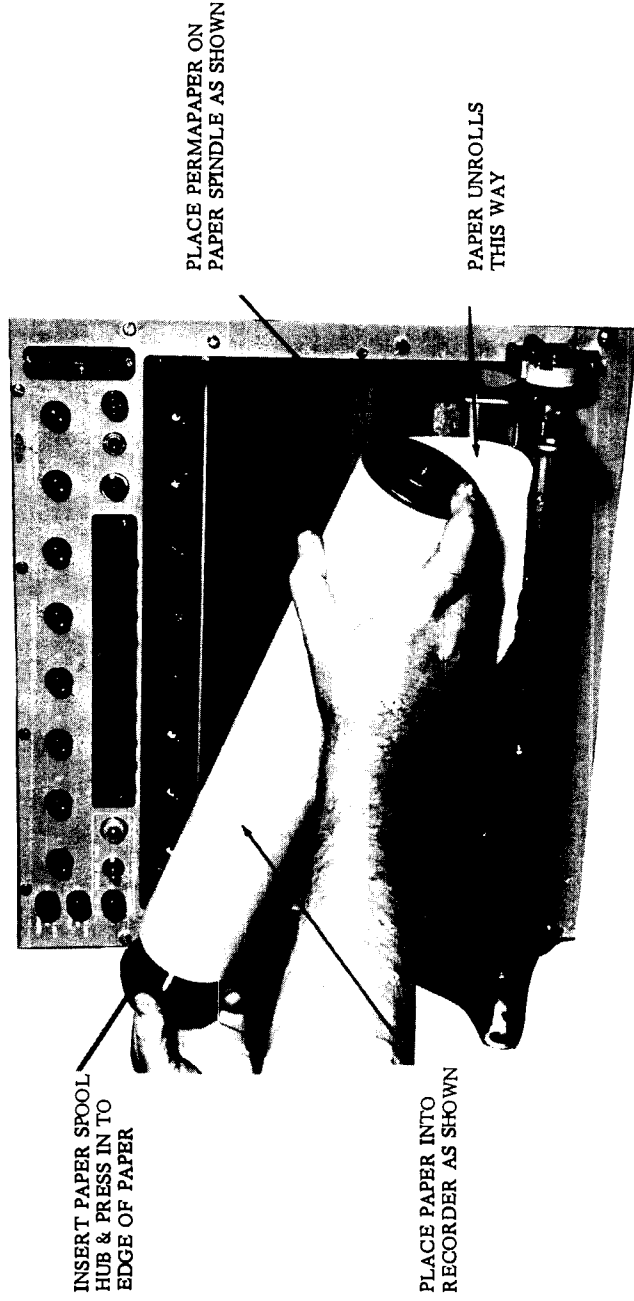
PLATEN TABLE IN OPEN POSITION



REMOVING PAPER TAKE-UP SPINDLE



RELEASING PLATEN TABLE



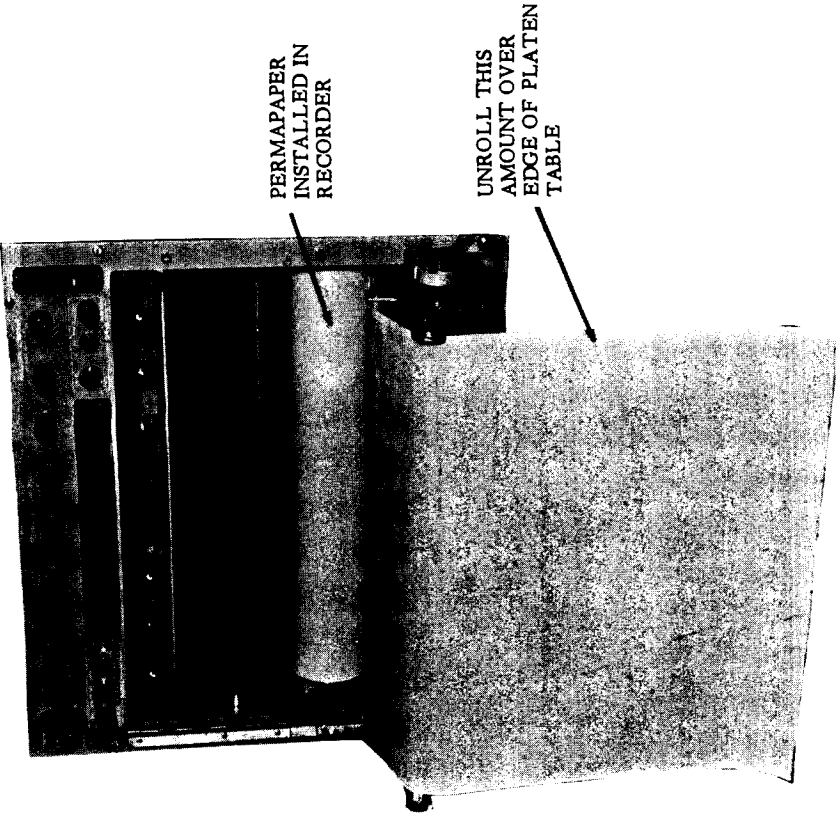
INSTALLING ROLL OF SANBORN PERMAPAPER

SANBORN COMPANY

PAPER LOADING SANBORN 350 STYLE RECORDER

1. SANBORN 350 STYLE RECORDER
2. REMOVING PAPER TAKE-UP SPINDLE
3. RELEASING PLATEN TABLE
4. PLATEN TABLE IN OPEN POSITION
5. INSTALLING ROLL OF SANBORN PERMAPAPER
6. PREPARING PERMAPAPER BEFORE CLOSING PLATEN TABLE
7. PREPARING PERMAPAPER FOR INSERTION INTO DRIVE ROLL
8. INSERTING PERMAPAPER INTO DRIVE ROLL
9. GUIDING PERMAPAPER OUT OF RECORDER
10. CHECKING PAPER TRACKING
11. GUIDING PERMAPAPER ONTO PAPER TAKE-UP

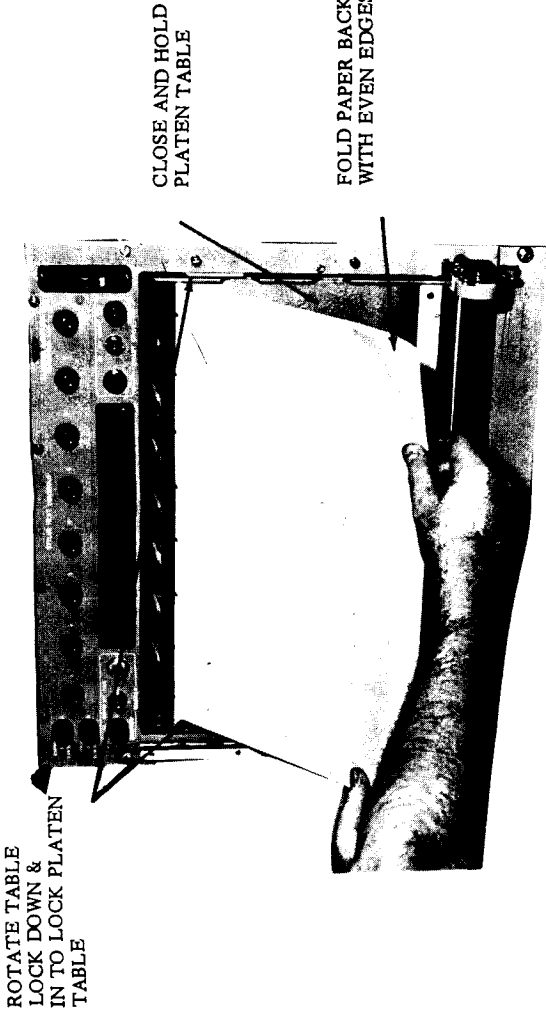
Prepared by Engineering Publications Dept.
Sanborn Company
Waltham, Mass.



PERMAPAPER
INSTALLED IN
RECORDER

UNROLL THIS
AMOUNT OVER
EDGE OF PLATEN
TABLE

PREPARING PERMAPAPER BEFORE CLOSING PLATEN TABLE

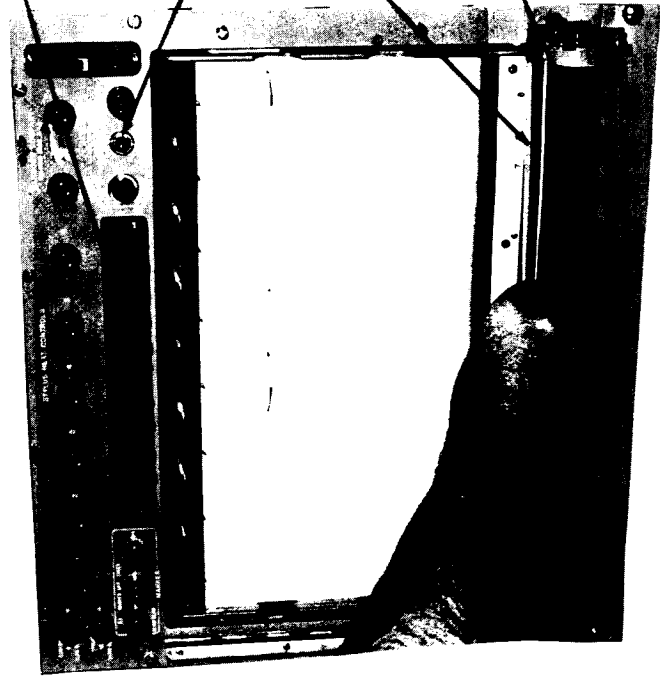


ROTATE TABLE
LOCK DOWN &
IN TO LOCK PLATEN
TABLE

CLOSE AND HOLD
PLATEN TABLE

FOLD PAPER BACK
WITH EVEN EDGES

PREPARING PERMAPAPER FOR INSERTION INTO DRIVE ROLL



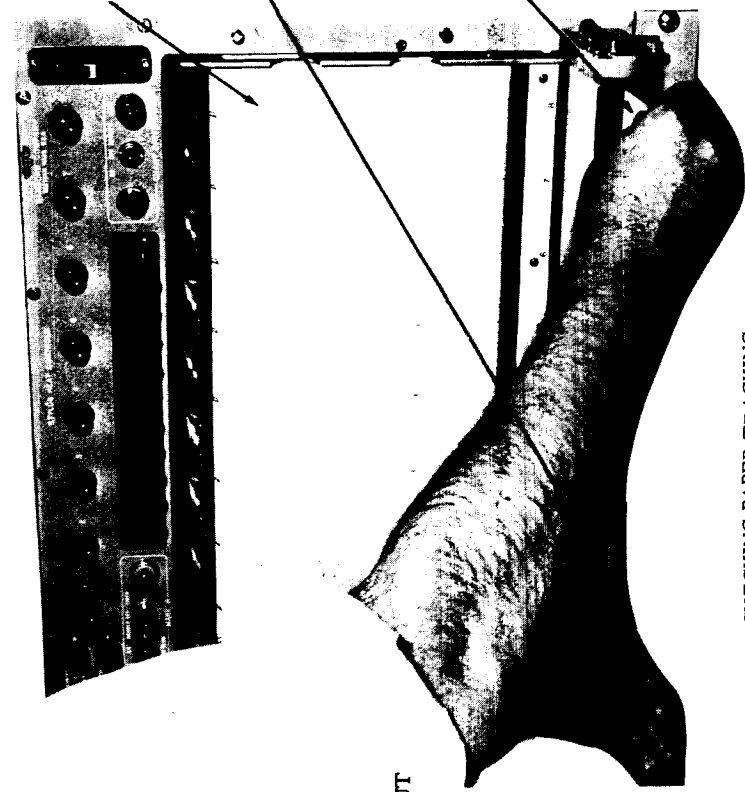
SPEED SET AT
5 MM/SEC.

SWITCH ON

GRASP PAPER IN
BOTH HANDS AS IT
STARTS TO FEED OUT

PAPER GOES BEHIND
PAPER TAKE-UP
SPINDLE

GUIDING PERMAPAPER OUT OF RECORDER

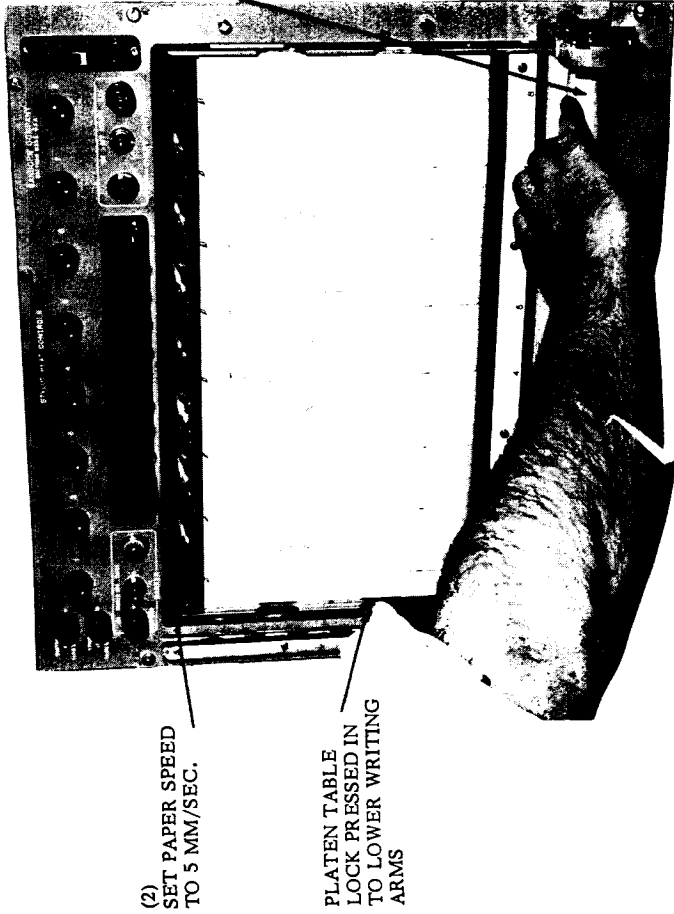


(1) WHEN PAPER IS FEED-
ING OUT OF RECORDER
CHANGE SPEED TO
100MM/SEC. RUN ENOUGH
PAPER TO CHECK PAPER
TRACKING ACROSS
PLATEN. SHUT OFF
PAPER FEED.

(2) WHEN TRACKING IS
CORRECT AT PLATEN.
CUT OFF EXCESS PAPER.
LEAVE AMOUNT
INDICATED.

(3) HOLD PAPER STRAIGHT
OUT & TIGHT. ADJUST
FIBRE CORE UNTIL IT
IS CENTERED ON
PAPER

CHECKING PAPER TRACKING



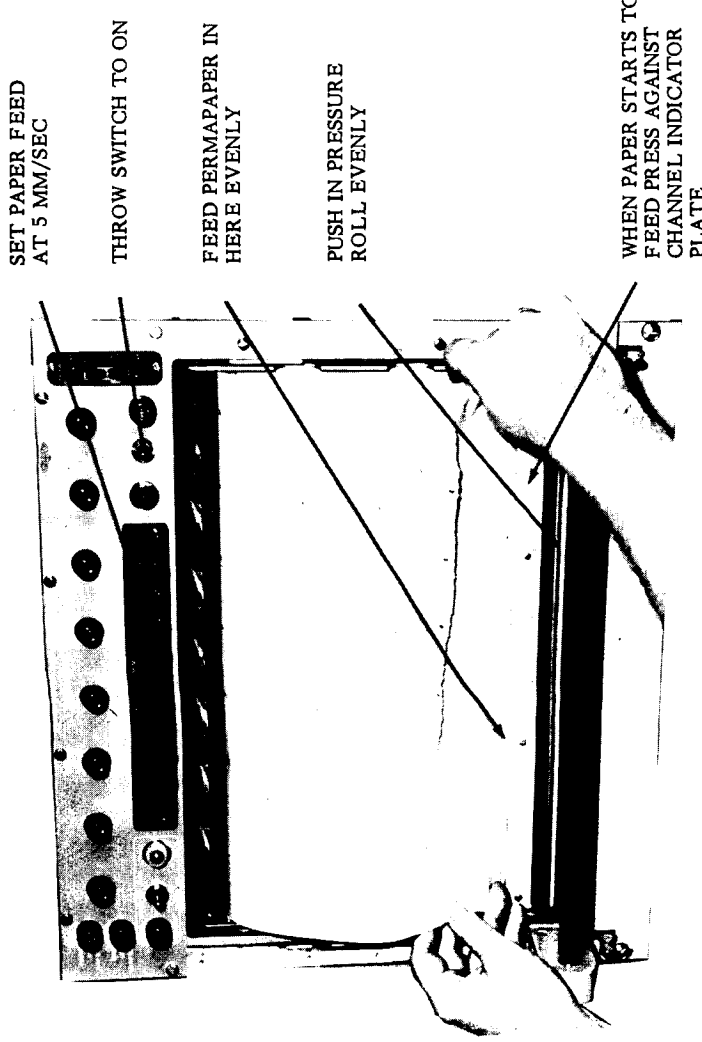
(2) SET PAPER SPEED
TO 5 MM/SEC.

PLATEN TABLE
LOCK PRESSED IN
TO LOWER WRITING
ARMS

(1) CAREFULLY WRAP &
HOLD PAPER AROUND
CORE. KEEP CORE IN
POSITION WITH RESPECT
TO PAPER

(3) AS PAPER ROLLS ON
SPINDLE SEE THAT
IT IS WRAPPING EVENLY.
ROLL END MUST BE
FLAT WITHIN 1/16" TO
BE VIEWED ON SANBORN
CHART VIEWER

GUIDING PERMAPAPER ONTO PAPER TAKE-UP



SET PAPER FEED
AT 5 MM/SEC

THROW SWITCH TO ON

FEED PERMAPAPER IN
HERE EVENLY

PUSH IN PRESSURE
ROLL EVENLY

WHEN PAPER STARTS TO
FEED PRESS AGAINST
CHANNEL INDICATOR
PLATE

INSERTING PERMAPAPER INTO DRIVE ROLL

6. INSTALLING PERMAPAPER (Continued)

- d. Lift the Permapaper spool out of the recorder. Pull the left side disc from the spool. Remove and dispose of the unused paper and core.
- e. Place new Permapaper on spindle so that when the right end disc is held in your right hand the paper leaves the roll from the bottom toward you.
- f. Replace the left end disc. Press the discs toward each other so that the surface of each disc fits snugly against the Permapaper.
- g. Place the Permapaper spool in the recorder.
- h. Pull the Permapaper evenly over, and about 18 inches beyond, the edge of the platen table.
- i. Raise the platen table to its normal operating position and lock it in place by rotating the table lock down and in. Push in platen table lock. Push the pressure roll evenly inward to hold the paper against the drive roll.
- j. Fold back about 3 inches of paper and insert the leading edge of the paper into the opening just above the channel indicator plate. Run the chart at 5 mm./second, and feed Permapaper until the drive roll catches it. Hold fingers against channel indicator plate until paper feeds out.
- k. As the paper moves out of the recorder, change speeds to 100 mm./second until paper is tracking properly at platen. Cut off excess paper leaving about 6 inches. Pull it under the take-up shaft. Hold paper straight out and tight. Adjust fibre core until it is centered on paper. Carefully wrap and hold paper around core. Keep core in same position with respect to paper, set speed 5 mm./second. As paper rolls on spindle, see that it is wrapping evenly. Roll end must be flat within 1/16 inch to be viewed on SANBORN CHART VIEWER.

7. USING SANBORN CHART VIEWER MODEL 276

To edit and analyze the record on a Sanborn Chart Viewer Model 276, the record must be wound on the Recorder paper take-up following the instructions of paragraph 6.

Use the supplied hexagonal fibre core on the paper take-up shaft.

The completed record must have a roll end which is flat within 1/16 inch.

8. AUXILIARY MARKER

The auxiliary marker is added to the galvanometer left hand side. It may be AC driven similar to the galvanometer right hand side marker or DC driven by a Sanborn DC Transistor Marker Amplifier Model 188AP or 188APM.

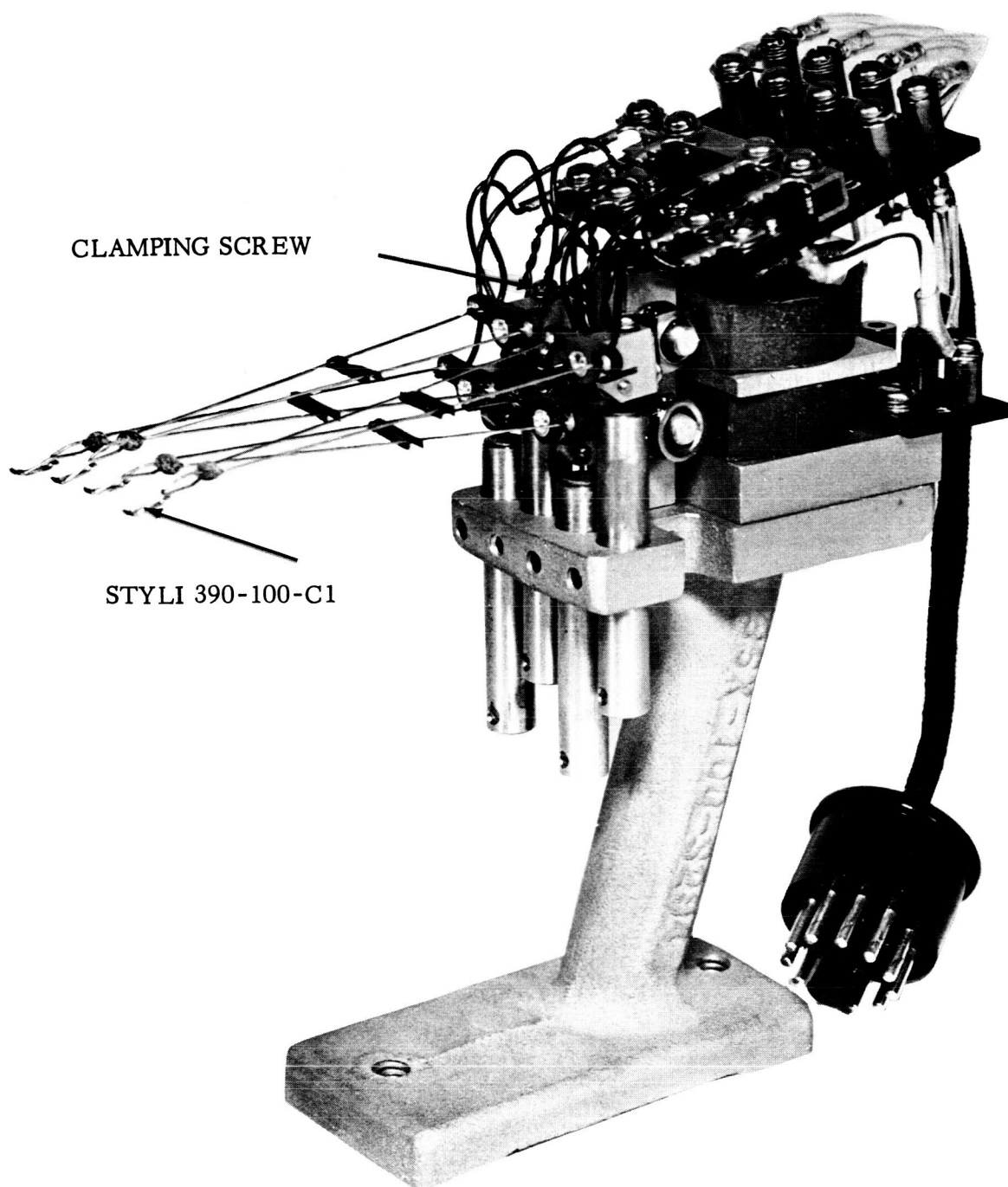
If the marker is AC driven, 110 VAC must be supplied externally. Apply the external 110 VAC between pins 5 and 16 on J412 to mark and remove the voltage to stop marking. J412 is located on the driver amplifier power supply at the recorder rear.

If the marker is driven by a Sanborn DC Marker Amplifier Model 188AP, operate as follows: When a mark is desired, apply +1.5 VDC having a source impedance up to 1000 ohms between pins 16 and 18 (ground) on J412 and remove the voltage to stop marking. The current from the voltage source will be approximately .5 ma. Higher voltages may be used but 3,000 ohms for each additional volt must be added to the source impedance.

If the marker is driven by a Sanborn DC Marker Amplifier Model 188APM, operate as follows: When a mark is desired, apply +1.5 VDC or -1.5 VDC having a source impedance up to 1000 ohms between pins 16 and 18 (ground) on J412 and remove the voltage to stop marking. This marker amplifier provides two marking signals (+ or - signal). The current from the voltage source will be approximately .5 ma. Higher voltages may be used but 3,000 ohms for each additional volt must be added to the source impedance.

If the standard right hand marker is driven by a Marker Amplifier Model 188AP or 188APM, the voltages mentioned above for the Model 188AP or 188APM are applied between pins 17 and 18 on J412.

9. The Multi-marker records four on-off events on one recording channel. Each multi-marker has 5 leads, one lead for each of the four event markers and a common return lead. Coil resistance is about 3.8 ohms. Deflection sensitivity is about 0.4 amp/mm, which then corresponds to about 1.5 volt/mm, or 3 volts for 2 mm deflection. This is for dc. For ac, 2 mm peak to peak deflection is produced by approximately 1 volt rms at 60 cps.



MULTIMARKER MODEL 199

9. MULTI-MARKER MODEL 199 (Continued)

When a multi-marker is used in place of a signal galvanometer, the Driver Amplifier Model 350-200 for the channel is removed. Input connections to the Multi-marker, if driven directly, are made to the connector on the Driver Amplifier Power Supply which originally mated with the removed Driver Amplifier. On this connector, pins 12, 13, 16 and 18 are the inputs and pin 17 the common return.

Heat for the Multi-marker styli is controlled at the channel stylus heat control on the recorder.

If the Multi-marker is not driven directly, then input connection is made to the driver.

SANBORN COMPANY
175 WYMAN STREET
WALTHAM 54, MASS.
TEL: TW 4-6300
AUGUST 16, 1960

REPLACEMENT PARTS LIST SUPPLEMENTS
RPL-350-600B-2A
RPL-350-600B-2B
SANBORN DRIVER AMPLIFIER
MODEL 350-600B

RPL-350-600B-2A
CR-10876 7/19/60 Schematic 350-600B-C1 Sub 3

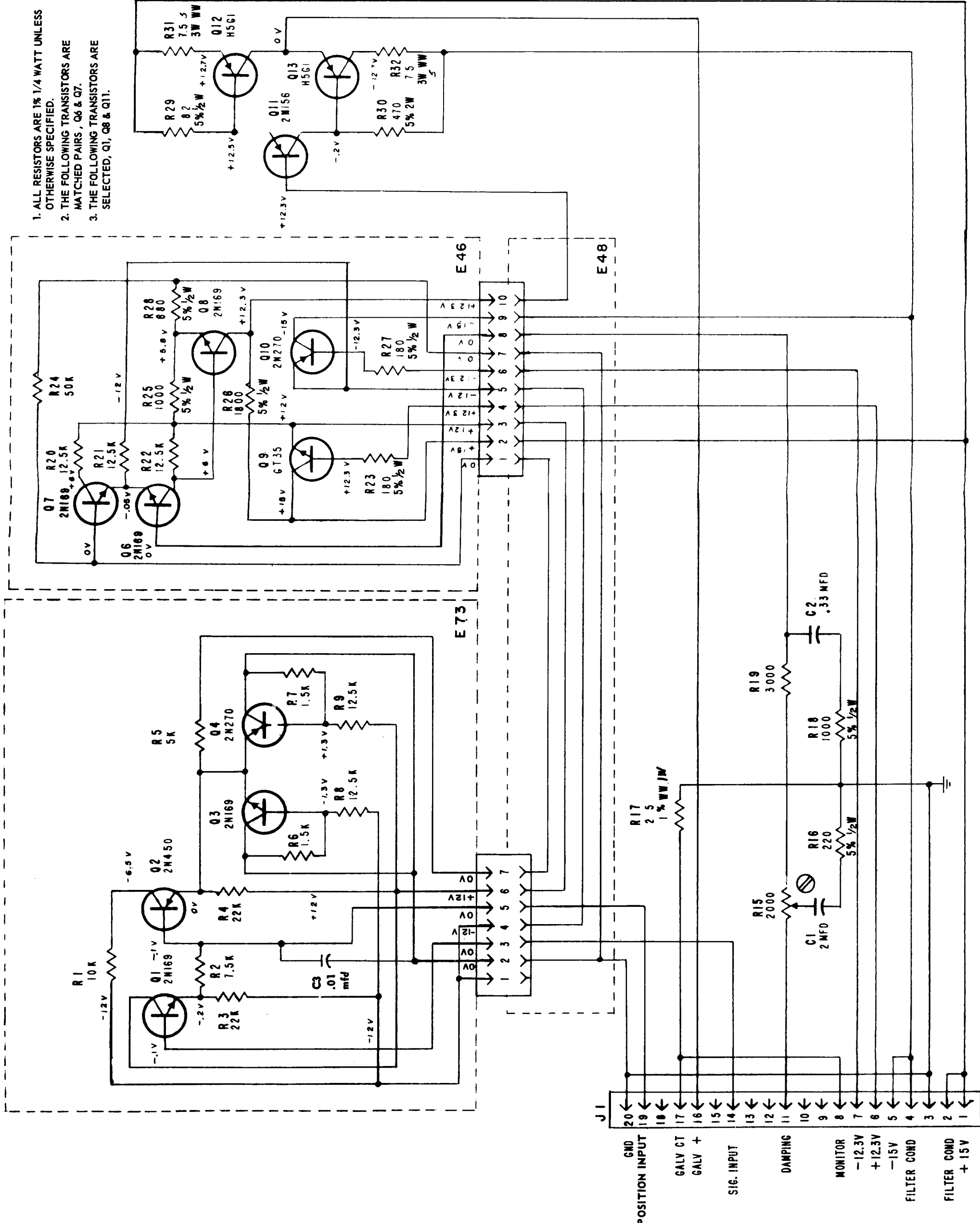
Sanborn Driver Amplifier Model 350-600B stamped with CR 10876 or higher will have the following change.

The 2N169 Transistor Q3 should be a selected type Sanborn Number 16T-5D to reduce non-linearity.

RPL-350-600B-2B
CR 10951 8/8/60 STANDARD CHANGE
Schematic: 350-600B-C1 Sub 4

Sanborn Driver Amplifier Model 350-600B stamped with CR10951 or higher will have the following change.

Capacitor C4 .22 mfd Sanborn Number 8B-52 Vendor Number Type 621 (Good-All) will be added in parallel with resistor R15. Reduces overshoot at chart edges from high frequency signals.



- 1. ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED.
- 2. THE FOLLOWING TRANSISTORS ARE MATCHED PAIRS, Q6 & Q7.
- 3. THE FOLLOWING TRANSISTORS ARE SELECTED, Q1, Q8 & Q11.

SYMBOL	DESCRIPTION	SANBORN NO.	VENDOR CODE
C1	2 mfd 200V	8B-42	P822(AER)
C2	.33 mfd 200V	8B-83	68P(SPR)
C3	.01 mfd	8E-6	8YA6-SI(CD)
J1	20-pin male connector	10E20-1MX	RM22020-1(ELC)
Q1	2N169 Transistor	16T-5B	(GE)
Q2	2N450 Transistor	16T-21	(GE)
Q3	2N169 Transistor	16T-5	(GE)
Q4	2N270 Transistor	16T-10	(RCA)
Q6	2N169 Transistor	16T-SBMP	(GE)
Q7	2N169 Transistor	16T-SBMP	(GE)
Q8	2N169 Transistor	16T-5B	(GE)
Q9	2N35/GT35 Transistor	16T-14	(GT)
Q10	2N270 Transistor	16T-10	(RCA)
Q11	2N156 Transistor	16T-10	(RCA)
Q12	H5G1 Power Transistor	16T-2C	(CBS)
Q13	H5G1 Power Transistor	16T-9	(MH)
		16T-9	(MH)
R1	10K 5%	50AB-103J	EB(AB)
R2	7.5K 1%	50A-752G	EB(AB)
R3	22K 5%	50AB-223J	EB(AB)
R4	22K 5%	50AB-223J	EB(AB)
R5	5K 1%	50H-502G	C-11(WEL)
R6	1.5K 1%	50H-152G	C-11(WEL)
R7	1.5K 1%	50H-152G	C-11(WEL)
R8	12,500 ohm 1%	50H-125-2G	C-11(WEL)
R9	12,500 ohm 1%	50H-125-2G	C-11(WEL)
R15	2,000 ohm Potentiometer	56A-26	37-2000S(CLA)
R16	220 ohm 5% 1/2W Composition	50A-221J	EB(AB), BTS(IRC), SI1/2(SPE)
R17	2.5 ohm 1% 1W Wire Wound	54A-143F	WW4(IRC)
R18	1K 5% 1/2W Composition	50AB-102J	EB(AB)
R19	3K 1% 1/4W Precision	50H-302G	C-11(WEL)
R20	12,500 ohm 1% 1/4W Precision	50H-125-2G	C-11(WEL)
R21	12,500 ohm 1% 1/4W Precision	50H-125-2G	C-11(WEL)
R22	12,500 ohm 1% 1/4W Precision	50H-125-2G	C-11(WEL)
R23	180 ohm 5% 1/2W Composition	50A-181J	EB(AB), BTS(IRC), SI1/2(SPE)
R24	50K 1% 1/4W Precision	50H-503G	C-11(WEL)
R25	1K 5% 1/2W Composition	50AB-102J	EB(AB)
R26	1.8K 5% 1/2W Composition	50AB-182J	EB(AB)
R27	180 ohm 5% 1/2W Composition	50A-181J	EB(AB), BTS(IRC), SI1/2(SPE)
R28	680 ohm 5% 1/2W Composition	50A-681J	EB(AB), BTS(IRC), SI1/2(SPE)
R29	82 ohm 5% 1/2W Composition	50A-820J	EB(AB), BTS(IRC), SI1/2(SPE)
R30	470 ohm 5% 2W Composition	52C-471J	HB(AB)
R31	7.5 ohm 5% 3W Wire Wound	53B-7R5J	151E(SPR)
R32	7.5 ohm 5% 3W Wire Wound	53B-7R5J	151E(SPR)

VENDOR ABBREVIATIONS

- AB Allen Bradley
- AER Aerovox
- CBS CBS Hytron
- CLA ClaroStat
- ELC Elco
- GE General Electric
- GT General Transistor
- IRC International Resistance Co.
- MH Minneapolis Honeywell
- RCA Radio Corporation of America
- SPE Sprague
- SPR Sprague
- WEL Welwyn
- CD Cornell Dubilier

CHANGES
CR9946 Capacitor "C3" Added. 5/26/59

SANBORN DRIVER AMPLIFIER
MODEL 350-600B
SCHEMATIC: 350-600B-C1 SUB 1
SANBORN COMPANY
WALTHAM MASS.
RPL-350-600B-2

SANBORN COMPANY
175 WYMAN STREET
WALTHAM 54, MASS.
TEL: TW-4-6300
JANUARY 6, 1959

REPLACEMENT PARTS LIST SUPPLEMENT
RPL-358-1100-1A

CABINET
MODEL 358-1100

RPL-358-1100-1A
CR9373 December 11, 1958

When Sanborn Cabinet Model 358-1100 is used with a supplied power of 50 cycles the
Blower Housing Assembly becomes Sanborn Number 358-1100-C21P3.

SYMBOL	DESCRIPTION	SANBORN NO.
B1101	Motor, Induction	38B-33

SANBORN COMPANY
175 WYMAN STREET
WALTHAM 54, MASS.
TEL: TW-4-6300
JANUARY 13, 1959

REPLACEMENT PARTS LIST SUPPLEMENT
RPL-358-1100-1B

SANBORN CABINET
MODEL 358-1100

RPL-358-1100-1B STANDARD CHANGE
CR 9440 January 6, 1959

Sanborn Cabinet Model 358-1100 stamped with CR 9440 or higher will have the following changes:

An extra cable terminating in eight miniature microphone connectors P1120 thru P1127 Sanborn Number 10B1-5MW is added. These connectors are used for preamplifier oscillator locking.

SANBORN CABINET
MODEL 358-1100
CABLE SCHEMATIC: 358-1100-C1 SUB 0

SANBORN COMPANY
WALTHAM MASS
RPL-358-1100-1
CR8979

MODIFIED BY IBM WITH
ADDITION OF INDICATOR I 1102

SYMBOL	DESCRIPTION	SANBORN INC.	VENDOR CODE
B1101	DRIVE MOTOR	384-14	5K435K103AX(GE)
F1101	20 AMP FUSE	248-25	FNW(BUS)
F1102	20 AMP FUSE	248-25	FNW(BUS)
J1101	656 LAMP BULB	304-3	120V-656-6W(WES)
J1102	3-CONTACT CONNECTOR	10G3-23MX	7327G(HUB)
J1103	DUPLEX OUTLET	10G3-24FX	5252(HUB)
J1104			
J1105			
J1106			
J1107			
J1108			
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SANBORN COMPANY
175 WYMAN STREET
WALTHAM 54, MASS.
TEL: TW-4-6300
JULY 31, 1959

REPLACEMENT PARTS LIST SUPPLEMENT
RPL-358-100-2A(Rev.)

SANBORN EIGHT CHANNEL RECORDER
MODEL 358-100

RPL-358-100-2A(Rev.)
CR 9876 May 4, 1959

When a Sanborn Pulser Model 183A-200 is installed in the recorder the following changes are made.

Terminal strip E701 is changed to a 12-Terminal Strip. Pulser connections are made to terminals 7, 8 and 11.

P102 terminal 7 (-110V DC) is connected to E701-7

P102 terminal 12 (5 mm.) is connected to E701-8

P102 terminal 13 (20 mm.) is connected to E701-11

CORRECTION
July 31, 1959

Fuse F103 should read: 1.5 amp slow blow Sanborn Number 26B-27,

SANBORN COMPANY
175 WYMAN STREET
WALTHAM 54, MASS.
TEL: TW-4-6300
AUGUST 8, 1960

REPLACEMENT PARTS LIST SUPPLEMENTS
RPL-358-100-2B
RPL-358-100-2C
SANBORN FLUSH FRONT RECORDER
MODEL 358-100

RPL-358-100-2B
CR 10865 6-21-60
Schematic 358-100-C1 Sub 9 STANDARD CHANGE

Sanborn Recorder Model 358-100 will have a capacitor added to the connectors J1001 thru J1008. The capacitor will prevent high frequency noise from breaking the stylus. Recorders stamped with change release CR 10865 or higher will have the capacitors installed.

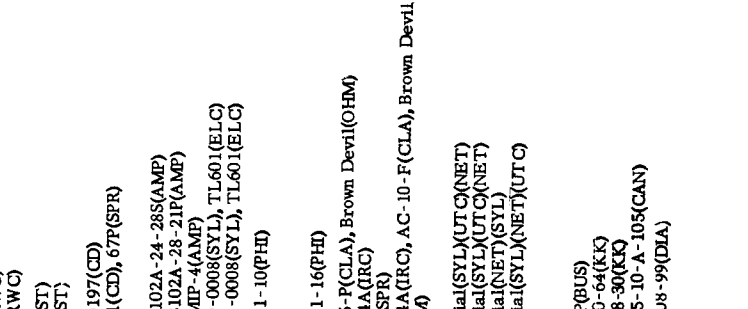
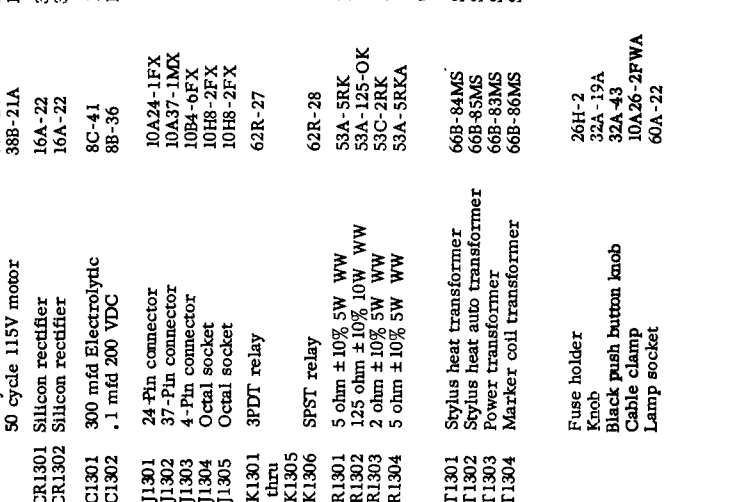
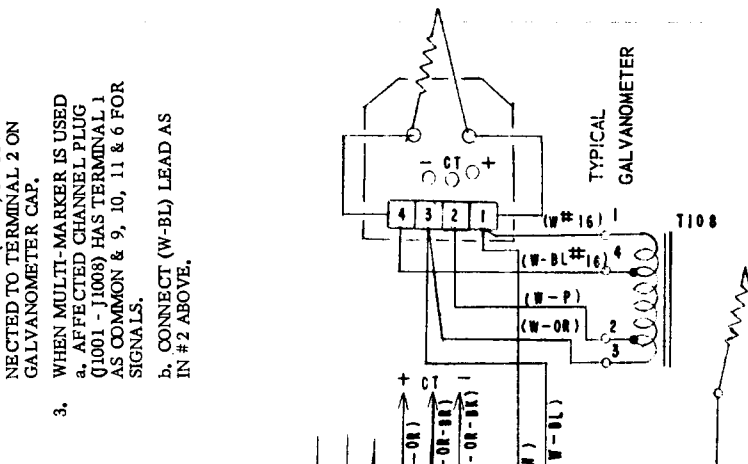
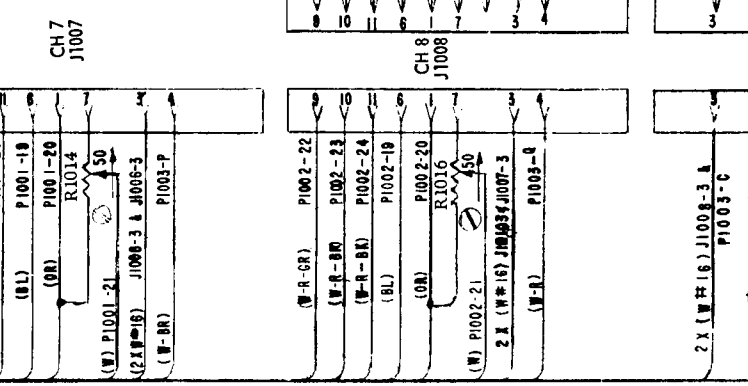
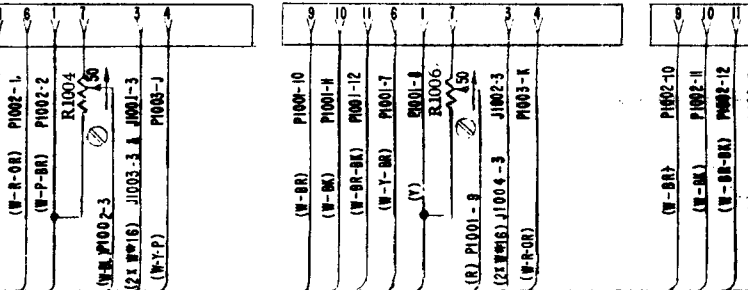
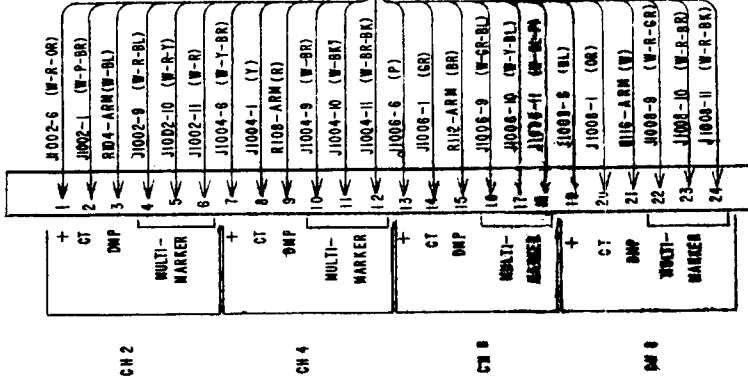
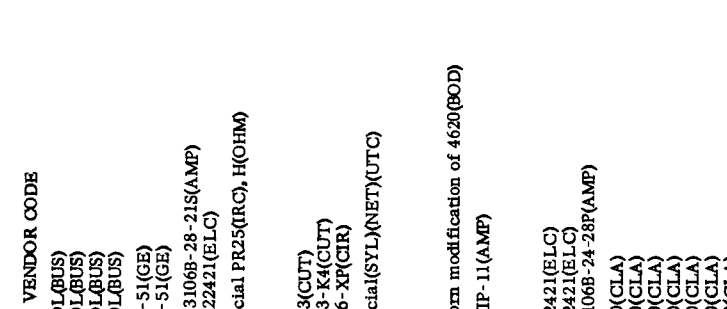
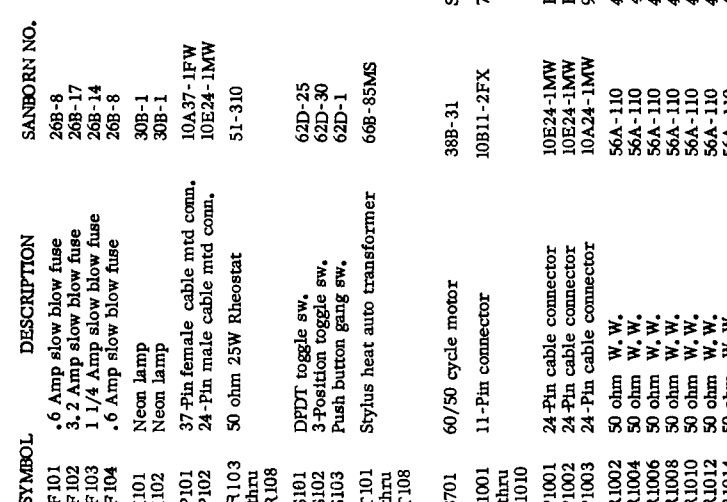
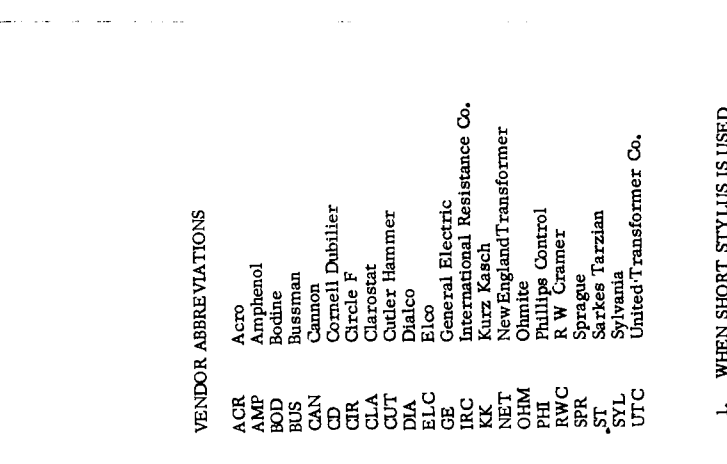
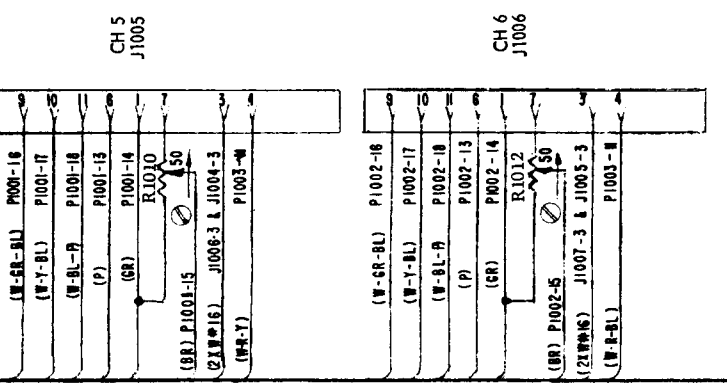
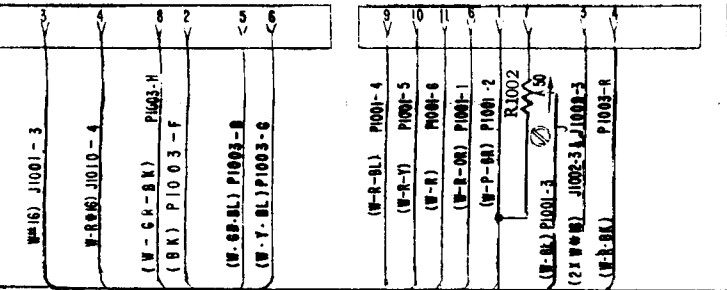
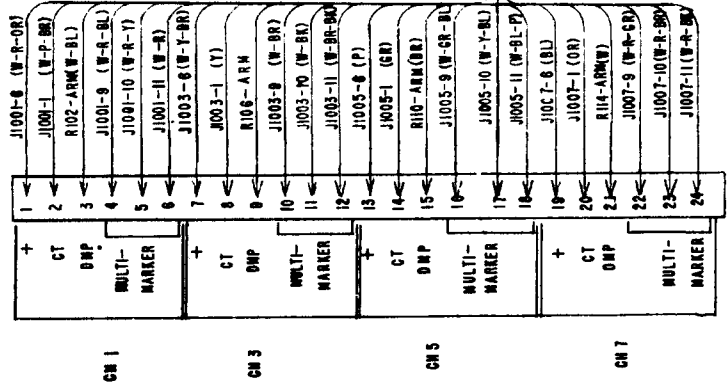
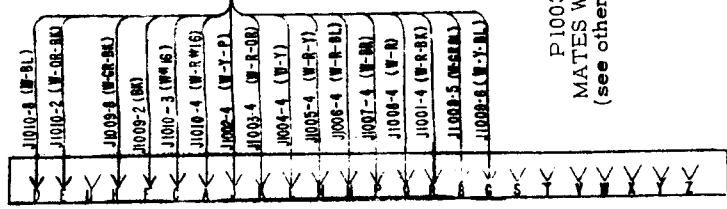
The capacitors C1001, C1002, C1003, C1004, C1005, C1006, C1007, C1008 are 50 MFD 15 VDCW Electrolytic Sanborn Number 8C-69 Vendor Number NLW378P (Cornell Dubilier)

C1001	is	across	pins	8	and	6	of	J1001
C1002	"	"	"	8	and	6	of	J1002
C1003	"	"	"	8	and	6	of	J1003
C1004	"	"	"	8	and	6	of	J1004
C1005	"	"	"	8	and	6	of	J1005
C1006	"	"	"	8	and	6	of	J1006
C1007	"	"	"	8	and	6	of	J1007
C1008	"	"	"	8	and	6	of	J1008

RPL-358-100-2C
CR 10888 8/4/60
Schematic: 358-100-C1 Sub 10

Sanborn Recorder Model 358-100 stamped with CR 10888 or higher will have the following change.

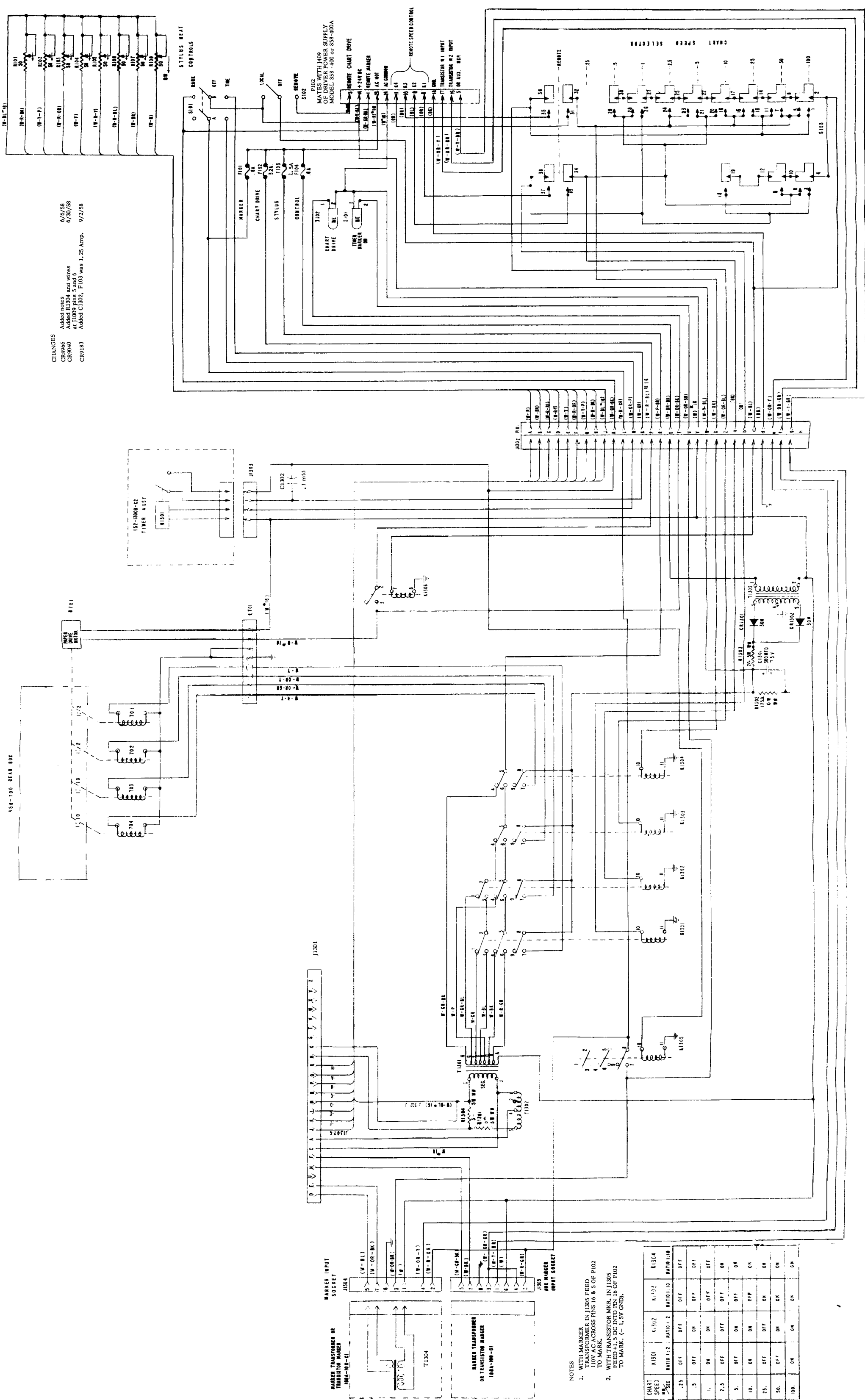
Resistor R1301 is deleted and a jumper used in its place. (To give stylus heat when more than one marker stylus is used.)



SANBORN RECORDER
MODEL 358-100
SCHEMATIC: 358-100-C1 SUB 5

SANBORN COMPANY
WAL THAM
MASS
RPL-358-100-2

SYMBOL	DESCRIPTION	SANBORN NO.	VENDOR CODE
F101	.6 Amp slow blow fuse	268-8	MDL(BUS)
F102	3.2 Amp slow blow fuse	268-17	MDL(BUS)
F103	1 1/4 Amp slow blow fuse	268-14	MDL(BUS)
F104	.6 Amp slow blow fuse	268-8	MDL(BUS)
I101	Neon lamp	30B-1	NE-51(GE)
I102	Neon lamp	30B-1	NE-51(GE)
I101	37-Pin female cable mtd conn.	10A37-1FW	10A37-1FW
I102	37-Pin male cable mtd conn.	10E24-1MW	10E24-1MW
R103	50 ohm 25W Rheostat	51-310	Special PR25(IRC), HO(HM)
R108			
T101	DPDT toggle sw.	62D-25	8833(CUT)
T102	3-Position toggle sw.	62D-30	7563-K4(CUT)
T103	Push button gang sw.	62D-1	1886-XP(CIR)
T101	Stylus heat auto transformer	66B-85MS	Special(SYL)(NET)(UTC)
T108			
M101	60/50 cycle motor	38B-31	Sanborn modification of 4620(BOD)
M1001	11-Pin connector	10B11-2FX	77-MIP-11(AMP)
M1010			
C1001	24-Pin cable connector	10E24-1MW	RM22421(ELC)
C1002	24-Pin cable connector	10E24-1MW	RM22421(ELC)
C1003	24-Pin cable connector	10A24-1MW	97-3106B-24-28F(AMP)
C1002	50 ohm W.W.	56A-110	43-50(CLA)
C1004	50 ohm W.W.	56A-110	43-50(CLA)
C1006	50 ohm W.W.	56A-110	43-50(CLA)
C1008	50 ohm W.W.	56A-110	43-50(CLA)
C1010	50 ohm W.W.	56A-110	43-50(CLA)
C1012	50 ohm W.W.	56A-110	43-50(CLA)
C1014	50 ohm W.W.	56A-110	43-50(CLA)
C1016	50 ohm W.W.	56A-110	43-50(CLA)
S101	SPDT coin sw. on timer	62C-6	2CMD1-2AXX(ACR)
S11301	60 cycle 115V motor	38B-21	117(RWC)
S11302	50 cycle 115V motor	38B-21A	117(RWC)
S1R1301	Silicon rectifier	16A-22	30M(ST)
S1R1302	Silicon rectifier	16A-22	30M(ST)
C11301	300 mfd Electrolytic	8C-41	KP10197(CD)
C11302	.1 mfd 200 VDC	8B-36	P12P1(CD), 67T(SPR)
I1301	24 Pin connector	10A24-1FX	97-3102A-24-28S(AMP)
I1302	37-Pin connector	10A37-1MX	97-3102A-28-21P(AMP)
I1303	4-Pin connector	10B4-6FX	77-MIP-4(AMP)
I1304	Octal socket	10H8-2FX	7480-0008(SYL), TL601(ELC)
I1305	Octal socket	10H8-2FX	7480-0008(SYL), TL601(ELC)
K1301	3PDT relay	62R-27	80901-10(PHD)
K1302			
K1305			
K1306	SPST relay	62R-28	72901-16(PHD)
R1301	5 ohm ±10% 5W WW	53A-5RK	PR-5-P(CLA), Brown Devil(OHM)
R1302	125 ohm ±10% 10W WW	53A-125-OK	1-3/4A(RGC)
R1303	2 ohm ±10% 5W WW	53C-2RK	27B(SPR)
R1304	5 ohm ±10% 5W WW	53A-5RKA	1-3/4A(RGC), AC-10-F(CLA), Brown Devil(OHM)
T1301	Stylus heat transformer	66B-84MS	Special(STYL)(UTC)(NET)
T1302	Stylus heat auto transformer	66B-85MS	Special(STYL)(UTC)(NET)
T1303	Power transformer	66B-83MS	Special(NET)(SYL)
T1304	Marker coil transformer	66B-86MS	Special(SYL)(NET)(UTC)
F108	Fuse holder	26H-2	HKP(BUS)
K108	Knob	32A-19A	S230-64(KK)
B108	Black push button knob	32A-43	S328-30(KK)
C108	Cable clamp	10A-26-2FWA	2255-10-A-105(CAN)
L108	Lamp socket	60A-22	32408-99(DIA)



CUMULATIVE SPEED SEC	K1301		K1302		K1304	
	RATIO 1:1	RATIO 1:2	RATIO 1:1	RATIO 1:2	RATIO 1:1	RATIO 1:2
.25	OFF	OFF	OFF	OFF	OFF	OFF
.5	OFF	ON	OFF	OFF	OFF	OFF
1.	ON	ON	OFF	OFF	OFF	OFF
2.5	OFF	OFF	OFF	OFF	ON	ON
5.	OFF	ON	OFF	OFF	ON	ON
10.	ON	ON	ON	OFF	ON	ON
25.	OFF	OFF	ON	ON	ON	ON
50.	OFF	ON	ON	ON	ON	ON
100.	ON	ON	ON	ON	ON	ON

LUBRICATION INSTRUCTIONS SANBORN 350 STYLE RECORDERS

1. Recorder Lubrication

The Recorder has been lubricated at Sanborn Company but will require lubrication after 2000 hours operation.

To lubricate the recorder follow these steps:

- Open rear door of cabinet.
- Disconnect cables connected to recorder rear. Caution: The recorder weighs 200 lbs. and requires two men to remove it.
- Remove the recorder as follows:
Push up on the two recorder locks on bottom front of recorder.
Pull out recorder part way (see figure 1) and remove 2 Hex head screws from each side of rack slide.
- Remove recorder, do not allow the weight of the recorder to be on recorder locks, place a 2 x 4 block of wood between the locks.
- Remove the top two Driver Amplifiers from the power supply which hangs on rear of recorder. Two screws will be exposed. Remove them. (See figure 2).
- Lift the power supply off the two retaining studs, allowing it to pivot at the bottom.
- Disconnect the three cables from the inner side of the power supply.
- Remove the power supply from the recorder by lifting it up and off the pivot.
- Disconnect the two cables from the timing chassis.

For the following steps refer to figures in the Recorder Replacement Parts List.

- Hold the timing chassis to prevent dropping onto Motor and Gear Box Assembly, while the four screws on each side of the recorder are removed. (See item 103 figure 1).
- Carefully pull the timing chassis up and out of the recorder.
- Motor and Gear Box will now be visible. Remove the four screws holding down lucite cover on gear box. Remove lucite cover.

Lubricate the following:

Oil all copper colored oilite bearings visible on gear box plates with Mobil DTE or equivalent.
Oil all spacers next to clutch adapters with Mobil DTE or equivalent.
Grease all gears and sprockets with Anderol 793 or equivalent.
Do not over lubricate.

Note: Those gears that are not exposed will be greased by exposed mating gears.

Replace lucite cover.

Remove the four screws (two on side) two on bottom of the Drive Chain Cover (Item 9 figure 12).

Slide cover over motor.

Grease the chain with chain grease Anderol L-732.

Oil the oilite bearings with Mobil DTE or equivalent. Oil motor with Bodine LU-17 oil.

Slide cover back over chain drive assembly. Replace screws.

Replace timer chassis and related cables. Replace power supply and driver amplifiers.

Open the platen table assembly (Item 53) Figure 1. Remove paper spindle assembly (Item 35) Figure 1.

Grease the spindle supports (Items 30, 77) Figure 1 with Anderol 793 or equivalent.

Apply vaseline sparingly to the cork washer of the brake roll support assembly. (Item 16)

Figure 1.

Apply Anderol 793 grease to the gear train (Item 76) Figure 1.

DO NOT ALLOW ANY GREASE TO COME IN CONTACT WITH THE RUBBER DRIVE ROLL ADJACENT TO THESE GEARS.

Close platen table.

To oil the oilite bearings within the paper take-up spindle bracket assembly (Item 49),

partially dismantle by removing 2 screws (Item 2) Figure 2A from inside section of assembly.

Do not drop parts from this assembly.

Oil with Mobil DTE or equivalent.

Reassemble.

Replace recorder in cabinet (two man job).

Fasten recorder to recorder rack slide.

Test for proper operation.

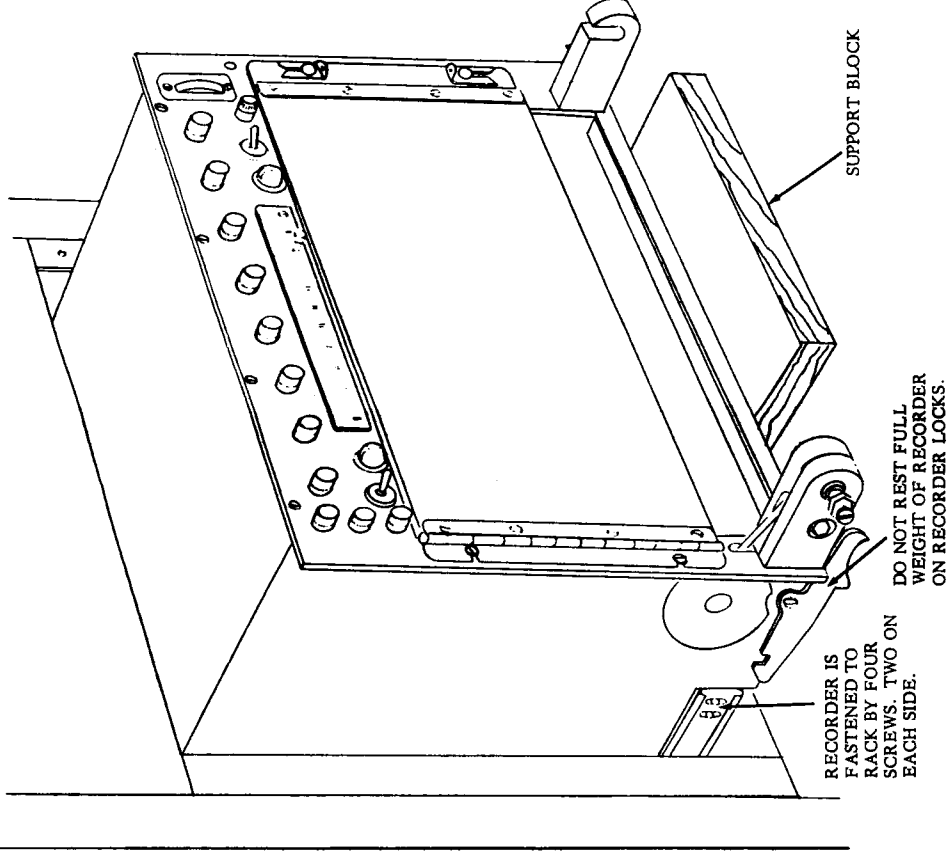


FIG. 1 RECORDER AT EXTENDED POSITION

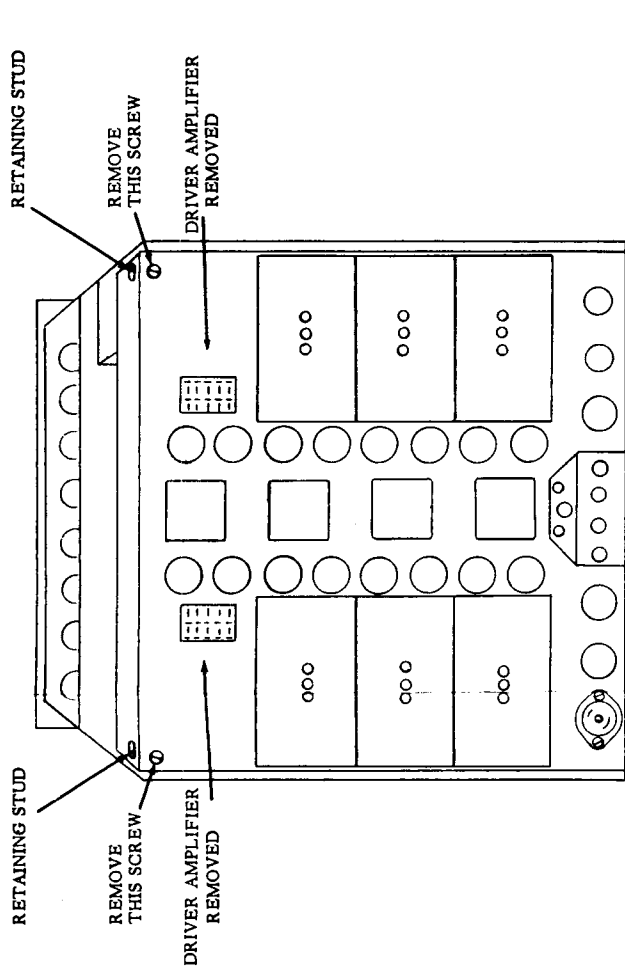


FIG. 2 RECORDER REAR VIEW

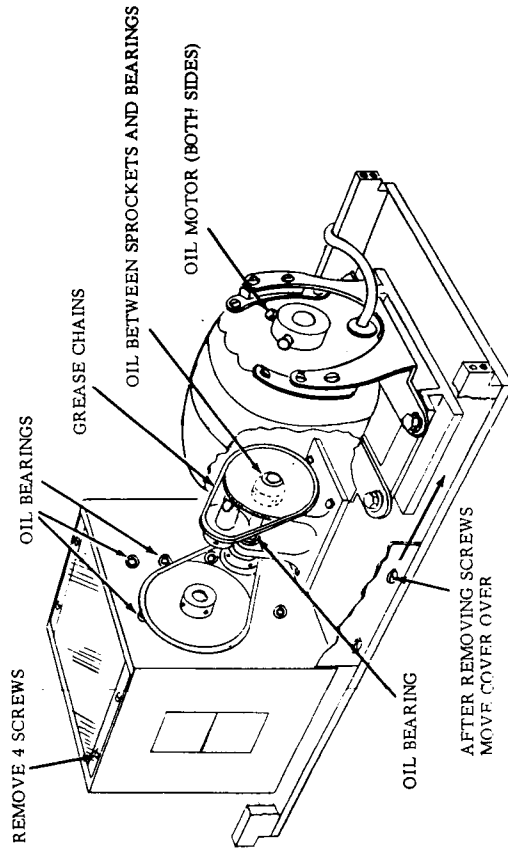


Fig. 3 GEAR BOX AND MOTOR ASSEMBLY

LUBRICATION
SANBORN RECORDER
MODEL 350

SANBORN COMPANY

Waltham
February

Mass.
1961

LC-350-1

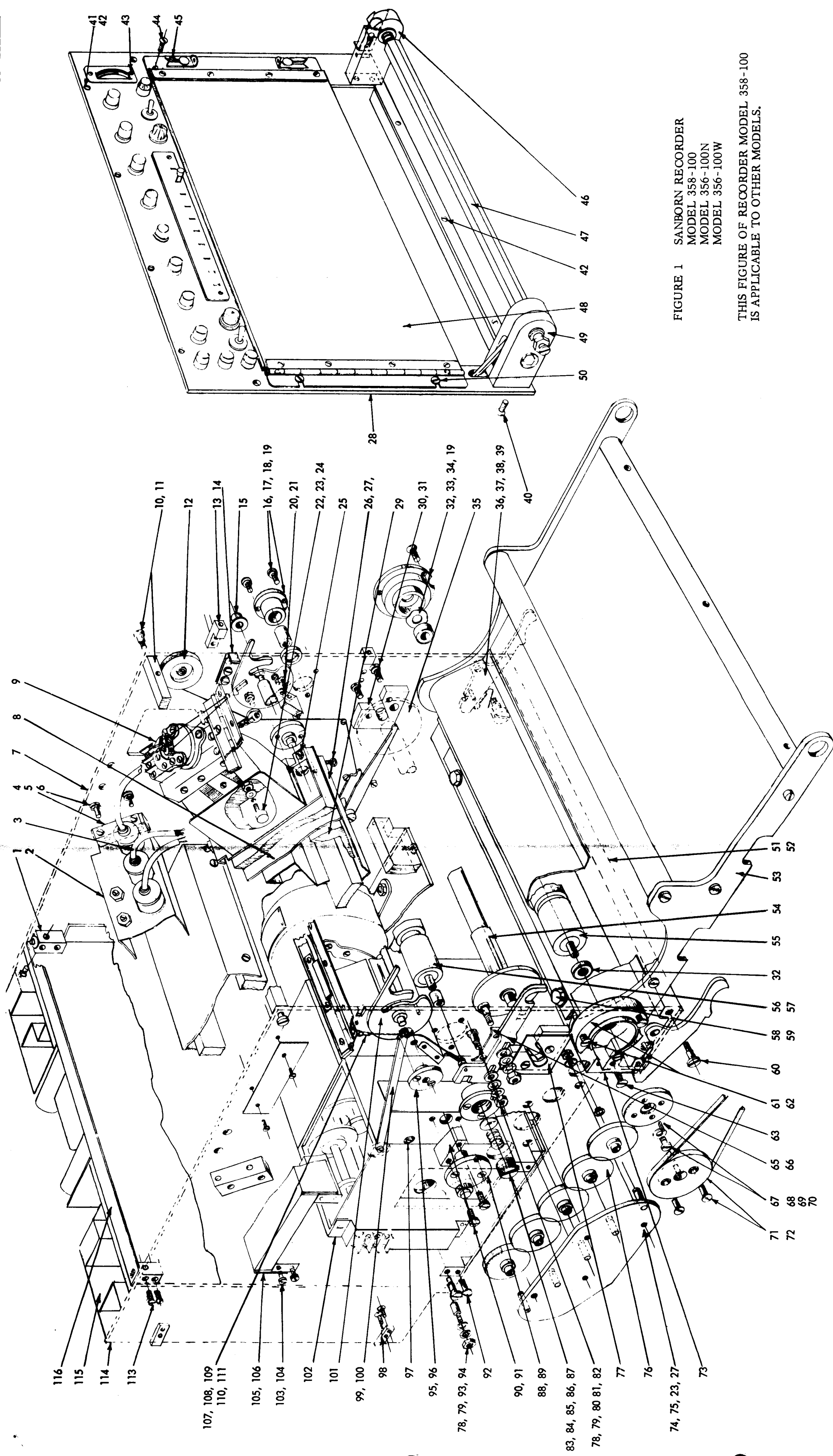


FIGURE 1 SANBORN RECORDER
 MODEL 358-100
 MODEL 356-100N
 MODEL 356-100W

THIS FIGURE OF RECORDER MODEL 358-100
 IS APPLICABLE TO OTHER MODELS.

FIGURE 1. SANBORN RECORDERS MODEL
358-100, 356-100N & 356-100W

REF. NO.	DESCRIPTION	SANBORN NO.
1	Mounting Block	812-4
2	Transfer Chassis Assembly See figure 2.	
3	Cable from galvanometer to socket from marker to socket from multi-marker to socket	10G11-1MWL 10G11-2MWL 10G11-3MWL
4	Block, Transfer Chassis Support	358-151
5	1/2 x 8-32 Sems	83A-8-8B
6	5/8 x 10-32 Sems	83A-10-10B
7	Side Plate, right	358-171
8	Bracket and Support Assembly, Short	358-100-C12
9	Galvanometer Assembly Recorder Model 358-100 See figure 3. Recorder Model 356-100N See figure 4. Recorder Model 356-100W See figure 5.	
10	Spacer Side Plates	358-134
11	Paper Drive Locating Screw	154-139
12	Paper Indicator Assembly See figure 10.	
13	Bracket (Panel Support)	358-132
14	3/8 x 6-32 Sems	83D-6-6B
15	Table Lock Stop	358-198
16	Bearing (Oilite)	5A-45
17	Washer Brake Disc	710-D-1
18	Ball Bearing	4N-1PP
19	Brake Roll Support Assembly, right	358-100-C5
20	5/16 x 8-32 O.H. M.S.	80A-832-5E
21	1/2 x 10-32 Sems	83A-10-8B
22	Tie Bar	358-153
23	Galvanometer Stop	358-186
24	# 10 Flat Washer	74A-10
25	Hex Nut	10-32
26	3/4 x 10-32 B.H. M.S.	80A-1032-12B
27	Support Stylus Transformer	358-1004
28	# 10 x 3/8 Sems	83A-10-6B
29	Mech. Assy (Front Panel) See figure 11.	358-100-C11
30	Support, Galvanometer Mounting Plate	358-1002
31	Spindle Support Paper Supply, right	358-112
32	7/16 x # 8 Sems	83A-8-7B
33	Ball Bearing	4N-1PP
34	Spring Washer	152-191
35	Support Drive Roll & Table, right	358-108
36	Paper Spindle Assembly	358-100-C3
37	Lock Recorder	358-145
38	Roll Pin (1/8 x 3/8)	44J-8-24
39	Spring Latch, recorder	358-143
40	Stud, Recorder Lock	358-142
41	1/2 x 10-32 F.H. M.S.	80A-1032-8D
42	Nylon Washer	710N-8
	1/2 x 8-32 Bindhead on bottom of Plate	80-832-8E
	1/2 x 8-32 O.H. on top of Plate	80A-832-8B
43	Plate Paper Quant. Indicator	
44	1/4 x 4-40 B.H. M.S.	358-131
45	3/8 x 6-32 F.H. M.S.	80A-440-4B
46	Pilot Latch, Viewing Window	80A-632-6D
47	P. T. U. Support Assembly, right	358-138
48	Paper Spindle Assembly	358-100-C17
49	Window Assembly	358-100-C25
50	P. T. U. Spindle Bracket Assembly See figure 2A.	358-100-C14
51	Screw, Retaining Viewing Window	358-100-C19
52	Lower Front Spacer	358-137
53	1/2 x 8-32 F.H. BRMS	358-136
54	Platen Table Assembly See figure 15.	80A-832-8D
55	Paper Spool, Hub & Disc Assembly	358-100-C24
56	Drive Roll Assembly	154-100-C3
57	Oilite Bearing (part of ref. no. 87)	158-100-C2
58	Brake Roll (same as ref. no. 55)	5A-37
59	5/16 x 1/2 Hex Bolt	158-100-C2
60	5/16 Bz. Lock Washer	890-51624-8H
61	Paper Drive Locking Screw	73A-5/16
62	3/8 x 6-32 F.H. M.S.	154-139
63	Support, Drive Roll & Table, left	80A-632-6D
64	1/2 x 8-32 F.H. Brass	358-109
65	Lock Galvanometer Table (Short)	80A-832-8D
66	Spring, Flat	358-169
67	5/16 x 6-32 Sems	358-177
68	# 6 Flat Washer	83D-6-5B
69	Key (Steel)	74A-6
70	Gear (Paper Drive)	154-743
71	1/2 x 8-32 F.H. M.S.	5G-42
72	Pulley & Locating Pin Assembly	80A-832-8D
73	Bar, Connecting Sides	358-100-C18
74	Gear Plate Assembly	358-172
75	Grip Ring	358-100-C7
76	Gear (Steel)	59A-9
77	Spindle Support L. H.	5G-43
78	Spring, Paper Supply	358-113
79	1/2 x 8-32 Sems	358-140
80	Hex Nut 10-32	83A-8-8B
81	# 10 Bz. Lock Washer	73A-10
82	# 10 S. S. Washer	74B-10S
83	Shoulder Bolt	74B-250B
84	Retainer Brake Spring	838-3
85	Brake Spring	358-117
86	Plate, Brake Spring	824-9
87	5/16 x 8-32 F.H. BRMS	358-115
88	Brake Roll Support Assembly, left	80A-832-5D
	Pin, galvanometer platform swivel	358-100-C4
		358-157
89	1/4 x 8-32 F.H.	
90	Tie Bar	80A-832-4D
91	1/2 x 10-32 Sems	358-153
92	# 10 Shoulder Screw	83A-10-8B
93	1/2 x 10-32 Sems	154-706
94	Lock Washer # 10	83A-10-8B
95	Shoulder Screw	73A-10
96	Support, Table Lock	154-738
97	5/16 x 8-32 F.H. BRMS	358-147
98	1/2 x 10-32 Sems	80A-832-5D
99	Bracket Shipping Support	83A-10-8B
100	5/16 x 6-32 F.H. BRMS	358-175
101	Link Platform	80A-632-5D
102	Link Pin, Platform	358-158
103	Table Lock & Shaft Assembly	358-146
104	Motor & Gear Box Assembly See figure 12.	358-100-C6
105	1/2 x 8-32 Sems	358-100-C21
106	Bar, Chassis Support	83A-8-8B
107	Timer Chassis Assembly See figure 14.	358-156
108	3/8 x 8-32 Sems	358-1300
109	Term. Lug & Cable Assembly	83A-8-6B
110	Cotter Pin	358-100-C10
111	1/8 x 1 Clear Plastic Tube	44A-7
112	3/16 x 4-40 Sems	
113	Cable Retainer	83A-4-3B
114	Bracket Chassis Retainer - Deleted	358-178
115	1/2 x 8-32 Sems	801-36
116	Side Plate L. H.	83A-8-8B
	Driver Amplifier	358-170
	Power Supply	350-200 (Series)
		358-400 (Series)
		or 356-400 Series
*47	CONSISTING OF:	
	SPINDLE	358-125
	SPRING	98-106
	BEARING BRONZE	5A-51
	RETAINER RING	59A-5
	INSERT (END OF SHAFT)	358-120
*48	CONSISTING OF:	
	WINDOW	358-139
	HINGE	826-7
	BRACKET	358-135

REF. NO.	DESCRIPTION	SANBORN NO.
1	Retainer ring 1/4"	59A-5
2	6-32 x 5/8 lg. round hd.	80A-632-10A
3	Paper take-up assembly and spindle retainer right casting	358-100-C26
4	Paper take-up assembly and spindle retainer left casting	358-100-C20
5	Pressure pulley, paper take-up	841-1
6	Oilite Bearing	8A-38
7	Pulley and clutch assembly	358-100-C23
8	Retainer ring 5/16	59A-9
9	Nex nut	710A-2P1
10	Shim washer	358-129
11	Stud	77A-40
12	Belt, V	81A-1032H
	10-32 x 1/4 lg. set screw	

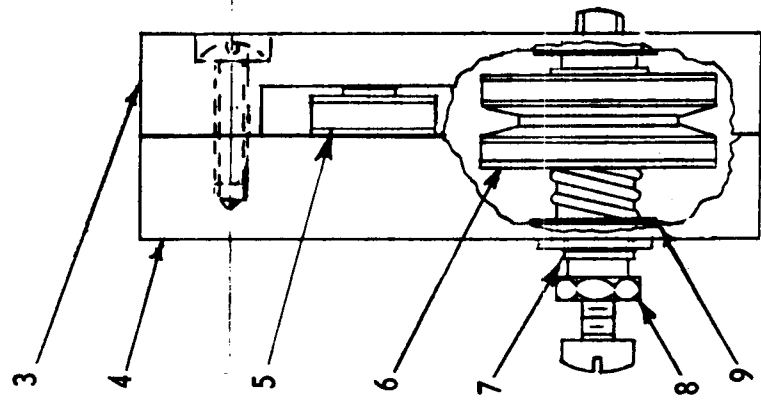
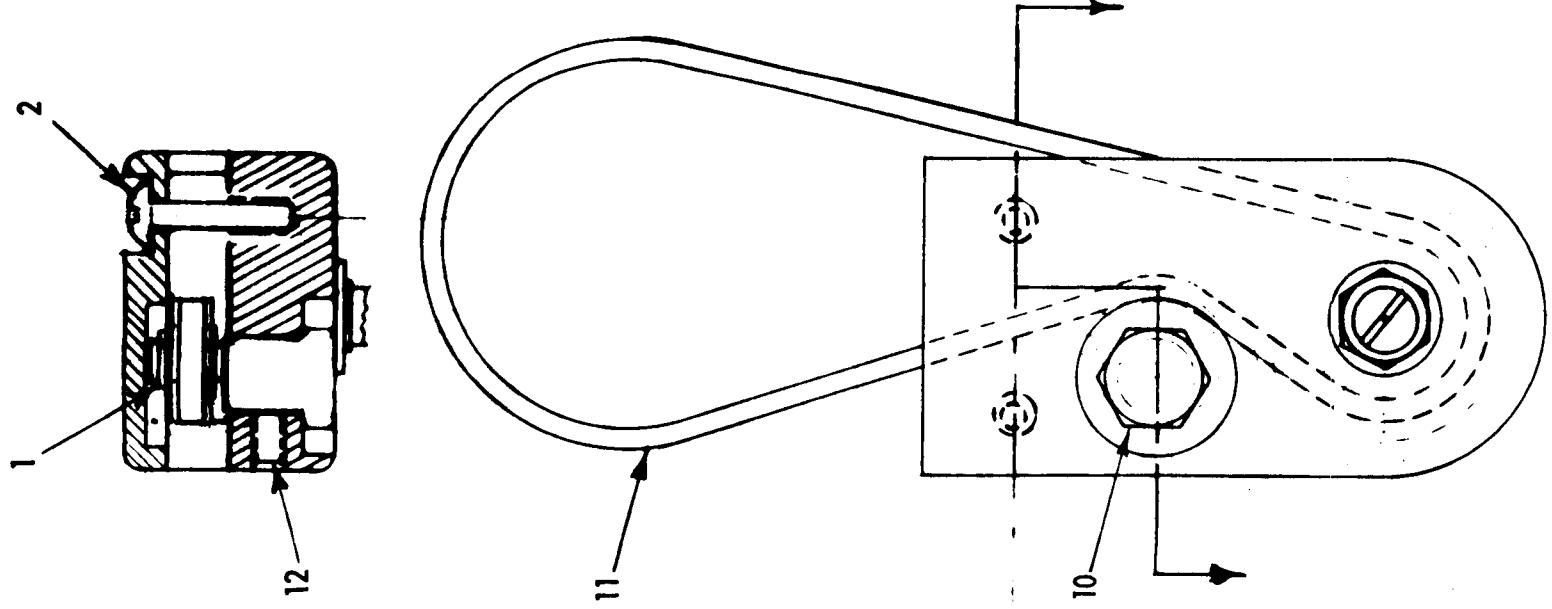


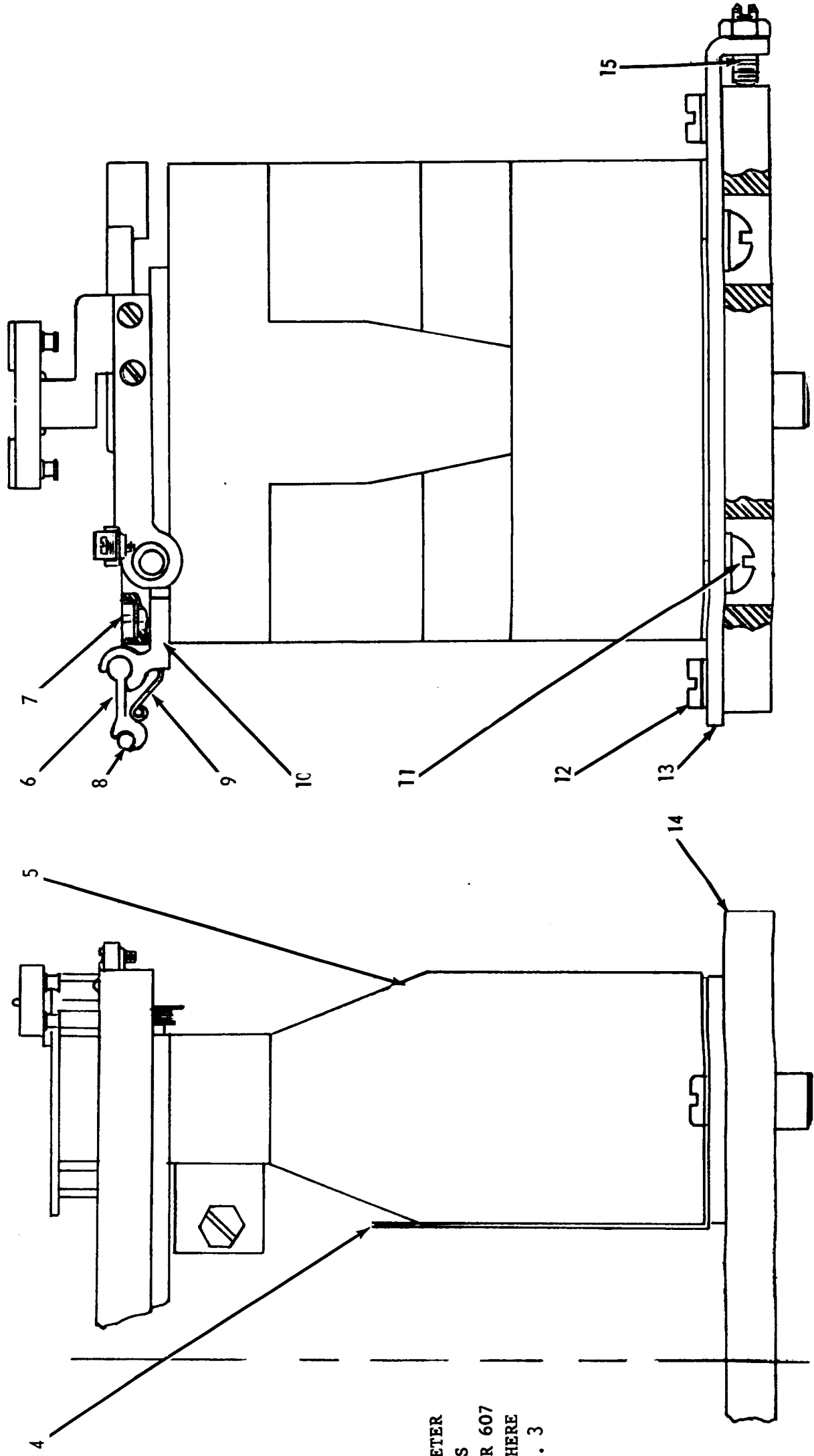
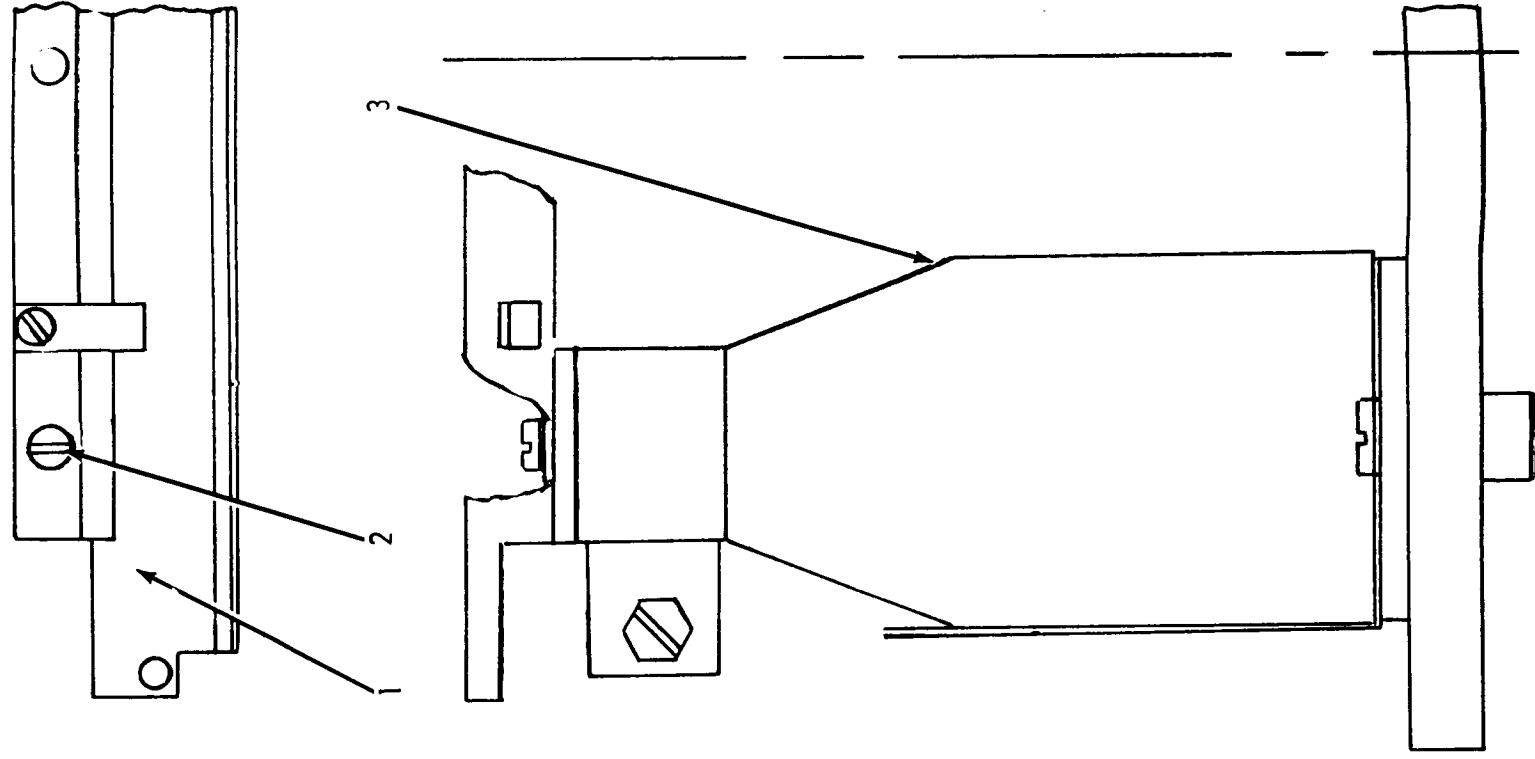
FIGURE 2 . TRANSFER CHASSIS ASSEMBLY

RECORDER 358-100, 356-100N TRANSFER CHASSIS ASSEMBLY SANBORN NO. 358-1000-C1		RECORDER 356-100W TRANSFER CHASSIS ASSEMBLY SANBORN NO. 356-1000W-C1	
CONSISTING OF:		CONSISTING OF:	
REF. NO.	DESCRIPTION	REF. NO.	DESCRIPTION
1	(Galvy leads plug-in) chassis	1	Galvy Plug-in Chassis
2	Rivet	2	Rivet
J1001 thru J1010	Socket 11 pin	J1001 thru J1008	Socket 11 pin
R1002 thru R1016	Pot 50 ohms wire wound	R1001 thru R1006	Pot 50 ohms WW
	Cable from galvanometer to socket		10G11-1MWL
	Cable from marker to socket		10G11-2MWL
	Cable from multi-marker to socket		10G11-3MWL
			356W-1002
			47A-14
			10B-11-2FX
			56A-110

FIGURE 2A. PAPER TAKE-UP SPINDLE BRACKET ASSEMBLY 358-100-C19

FIGURE 3. GALVANOMETER BANK ASSEMBLY 8 CHANNEL
SANBORN NUMBER 358-1000
CONSISTING OF

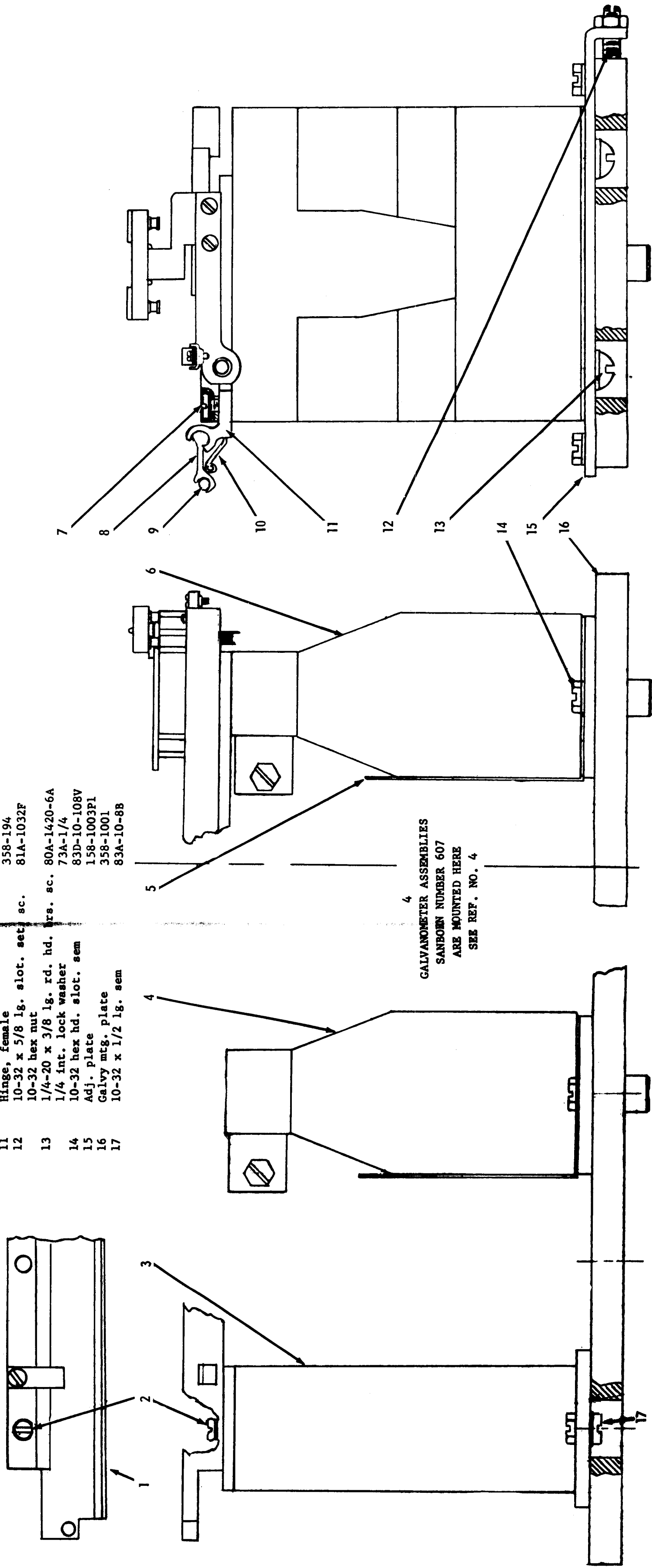
REF. NO.	DESCRIPTION	SANBORN NO.
1	Stylus rest assy.	358-100-C9
2	6-32 x 3/8 long sems	83A-6-6B
3	Galvy assy. See fig. 7	607
4	Galvy shield	358-1007
5	Galvy assy. See fig. 6	608
6	Hinge, male	358-195
7	6-32 x 1/2 long sems	83A-6-8B
8	Stylus reset rod (cemented to Ref. 6)	358-196
9	Leaf spring	358-197
10	Hinge, female	358-194
11	1/4-20 x 3/8 lg. rd. hd. brs. sc.	80A-1420-6A
	1/4 int. lock washer	73A-1/4
12	10-32 x 1/2 lg. sems	83A-10-8B
13	Adjusting plate	158-1003P1
14	Galvy mtg. plate	358-1001
15	10-32 x 5/8 lg. slot. set sc.	81A-1032F
	10-32 hex nut	



SIX GALVANOMETER
ASSEMBLIES
SANBORN NUMBER 607
ARE MOUNTED HERE
SEE REF. NO. 3

FIGURE 4. GALVANOMETER BANK ASSEMBLY (6 CHANNEL NARROW)
SANBORN NUMBER 356-1000N
CONSISTING OF

REF. NO.	DESCRIPTION	SANBORN NO.
1	Stylus rest assy.	358-100-C9
2	6-32 x 3/8 lg. sems	83A-6-6B
3	Stylus rest support	356N-1001
4	Galvy assy. See fig. 7	607
5	Galvy shield	358-1007
6	Galvy assy. See fig. 6	608
7	6-32 x 1/2 lg. sems	83A-6-8B
8	Hinge, male	358-195
9	Stylus reset rod (cemented to Ref. 8)	358-196
10	Leaf spring	358-197
11	Hinge, female	358-194
12	10-32 x 5/8 lg. slot. set. sc.	81A-1032F
13	10-32 hex nut	
14	1/4-20 x 3/8 lg. rd. hd. brs. sc.	80A-1420-6A
15	1/4 int. lock washer	73A-1/4
16	10-32 hex hd. slot. sem	83D-10-108V
17	Adj. plate	158-1003P1
18	Galvy mtg. plate	358-1001
19	10-32 x 1/2 lg. sem	83A-10-8B



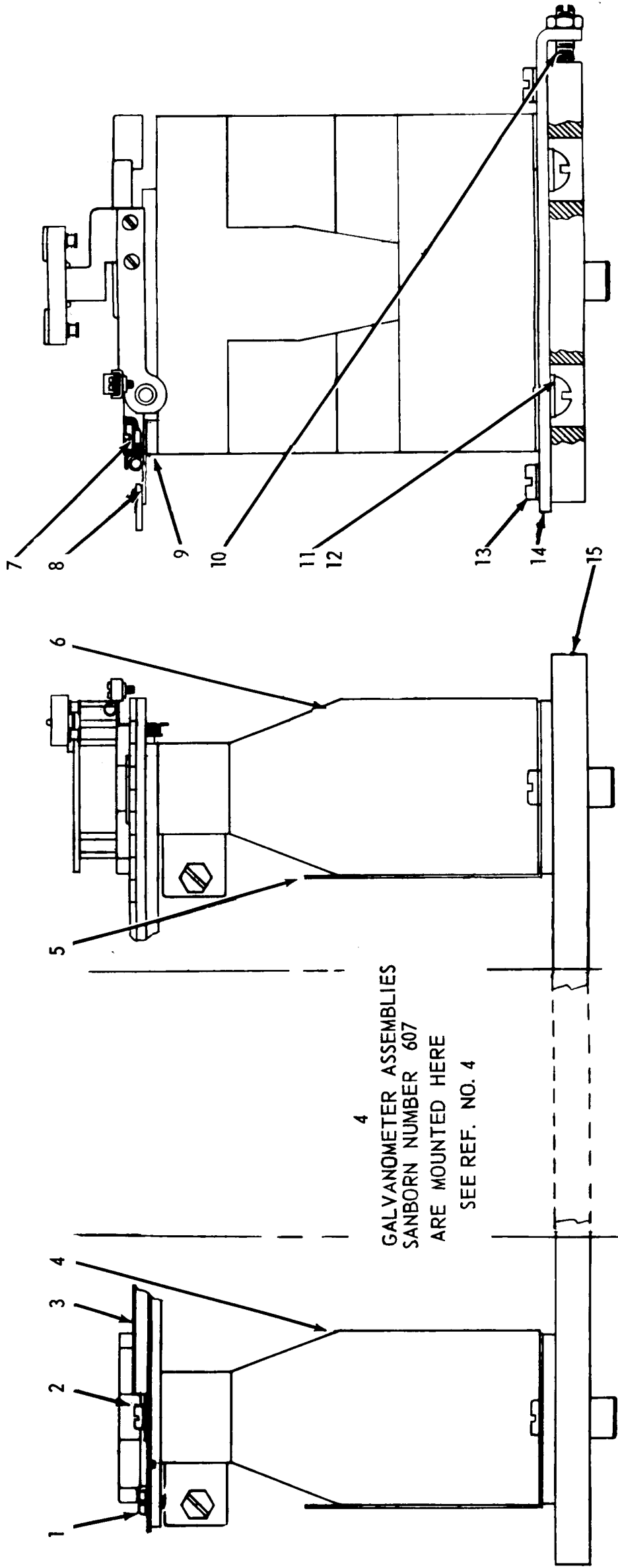


FIGURE 5 . GALVANOMETER BANK ASSEMBLY (6 CHANNEL WIDE)
SANBORN NUMBER 356-1000W
CONSISTING OF

REF. NO.	DESCRIPTION	SANBORN NO.
1	6-32 x 3/16 long sems	83A-6-3B
2	6-32 x 3/8 long sems	83A-6-6B
3	Stop, stylus rest	358-180
4	Galvy Assy. See fig. 7	607
5	Galvy shield NOT USED	358-1007
6	Galvy Assy. See fig. 6	608
7	6-32 x 1/2 long sems	83A-6-8B
8	Stylus rest assy (old style) On later models the stylus rest assy. is Sanborn number 358-100-C14. See ref. num- ber 1 on fig. 3 for view.	358-100-C9
9	Magnet support bar	356W-1004
10	10-32 x 5/8 lg. slotted set scr.	81A-1032F
11	10-32 hex nut	
12	1/4-20 x 3/8 lg. rd. hd. brs. sc.	80A-1420-6A
13	Int. lock washer 1/4	73A-1/4
14	10-32 x 1/2 long sems	83A-10-8B
15	Galvy adj. plate	356W-1003
	Galvy mtg. plate	356W-1001

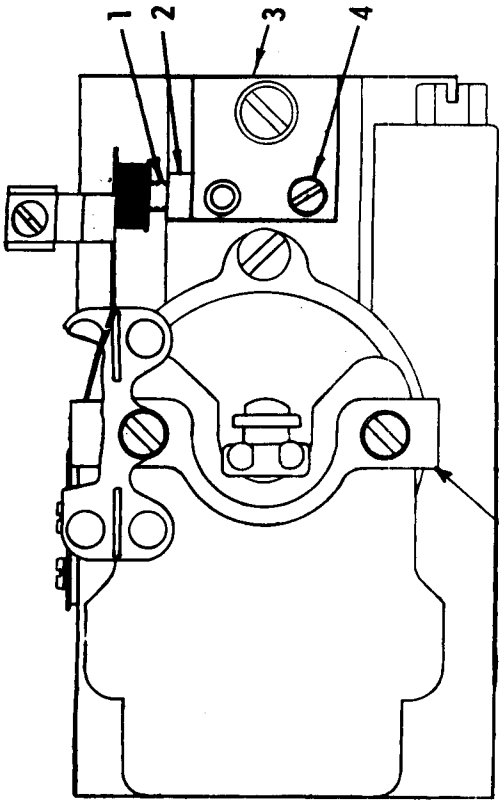


FIGURE 6 . GALVANOMETER ASSEMBLY
SANBORN NUMBER 608
CONSISTING OF:

REF. NO.	DESCRIPTION	SANBORN NO.
1	10-32 x 1/2 long set scr.	11D-10-8
2	Block, adjust lead marker	158-1033
3	Clamp, post	608-105
4	4-40 x 1/4 sem	83A-4-4B
5	Galvy assy. See Figure 7	607
6	Coil & stylus holder assy.	608-100-C3
7	Lead marker board assy.	158-1000-C10
8	Lead marker support	608-102
9	4-40 x 7/16 sem	83A-4-7B
10	4-40 x 5/16 sem	83A-4-5B
11	#4 int. lock washer	73A-4
12	Bridge	608-103

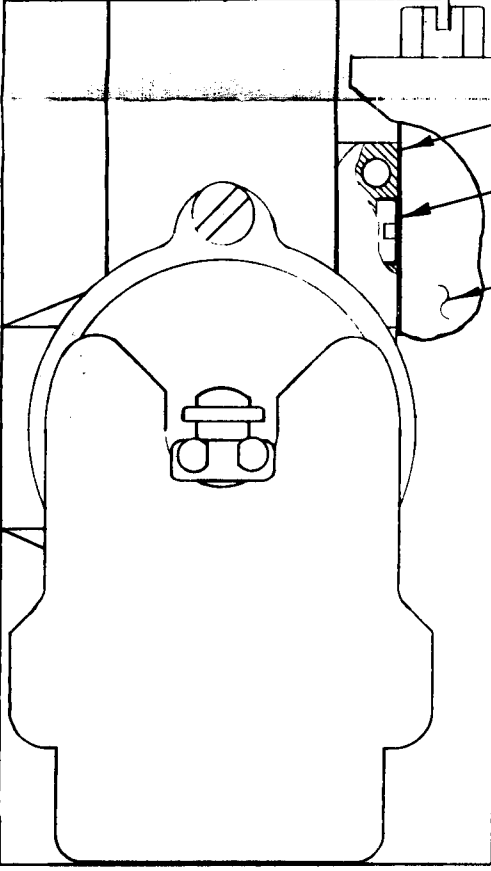
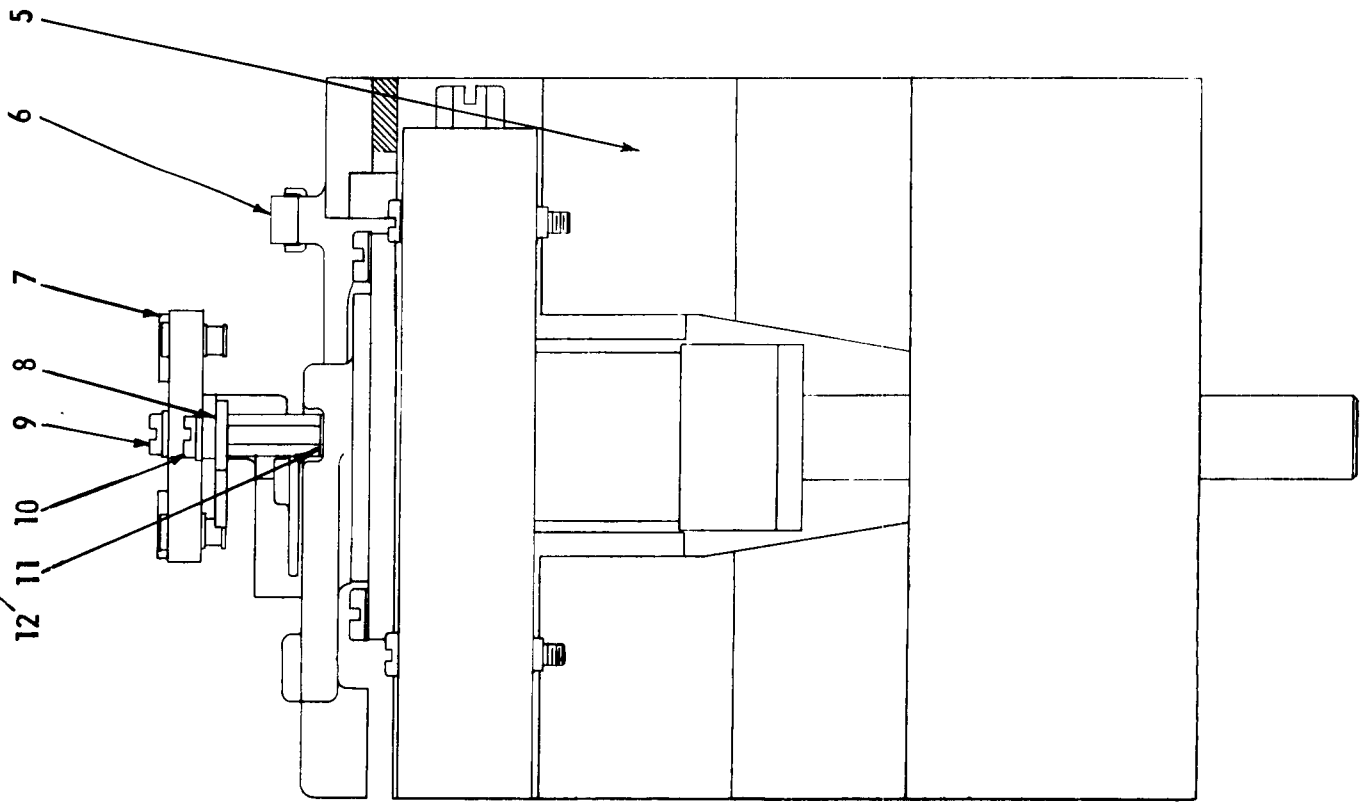
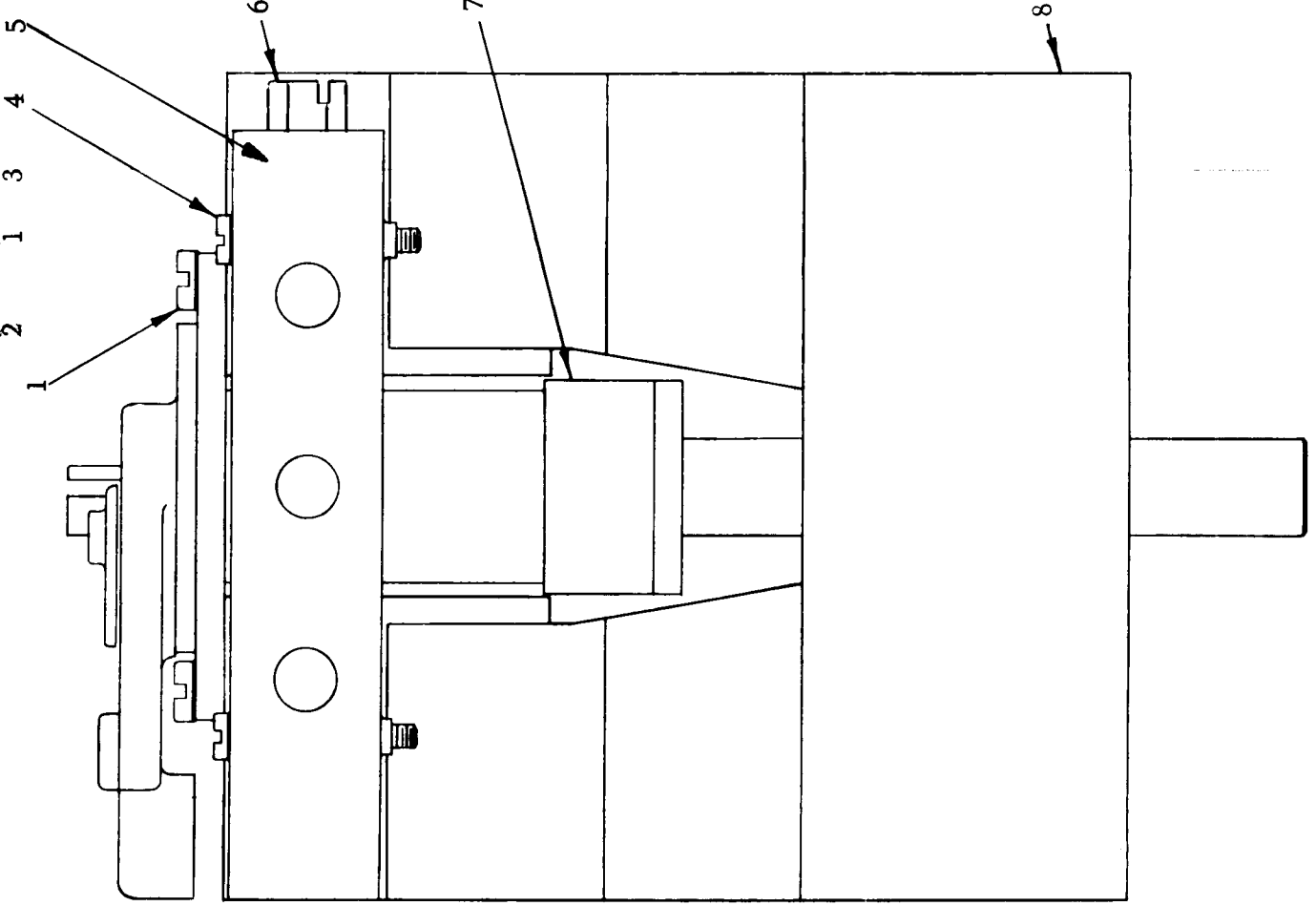


FIGURE 7 . GALVANOMETER ASSEMBLY
SANBORN NUMBER 607
CONSISTING OF:

REF. NO.	DESCRIPTION	SANBORN NO.
1	#4-40 sems x 5/16 long	83A-4-5B
2	Shunt block	158-1005
3	Shunt step block	158-1004
4	#4-40 sems x 7/8 long	83A-4-14B
5	Cover, shunt	158-1007
6	Assembly, shunt adjustment	158-1000-C1
7	Assembly, galvy (see figure 8)	606
8	Permanent magnet assembly	151-1001

SQUARE



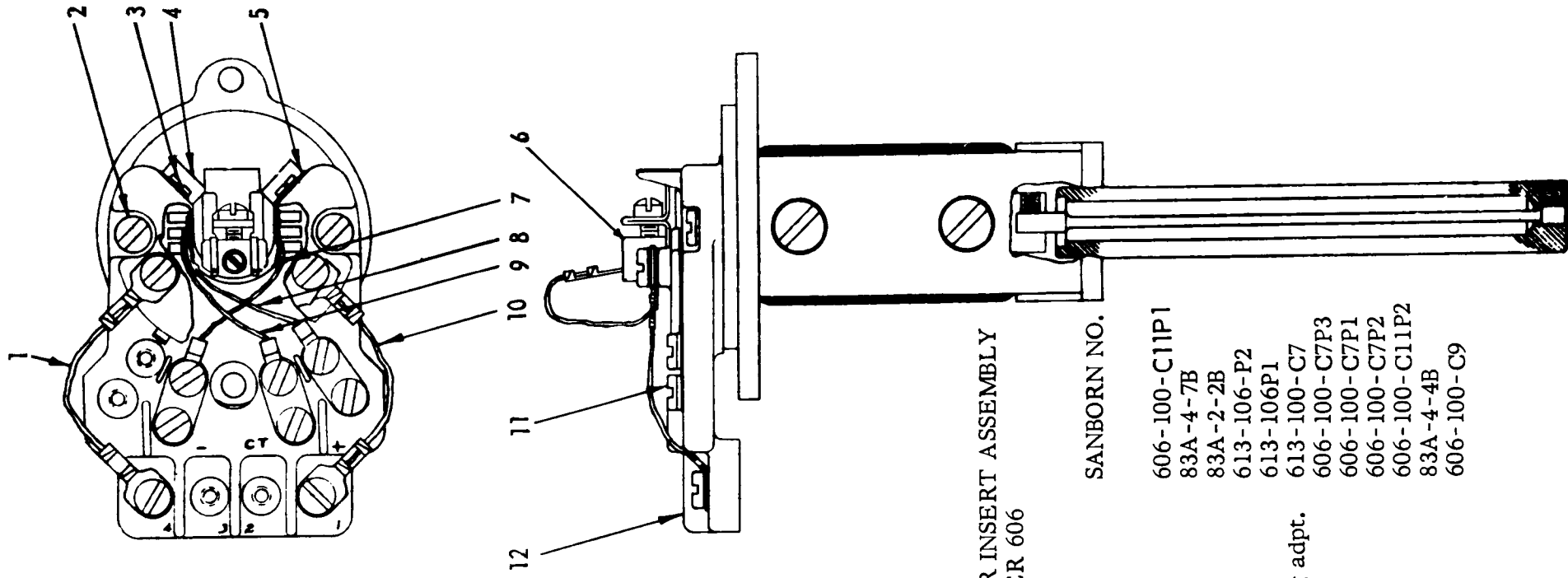


FIGURE 8 . GALVANOMETER INSERT ASSEMBLY
SANBORN NUMBER 606

REF. NO.	DESCRIPTION	SANBORN NO.
1	Jumper	606-100-C11P1
2	#4-40 x 7/16 long sems	83A-4-7B
3	#2-56 x 1/8 long sems	83A-2-2B
4	Stop	613-106-P2
5	Stop	613-106P1
6	Assembly stylus mounting adpt.	613-100-C7
7	Assembly, pigtail and lug	606-100-C7P3
8	Assembly, pigtail and lug	606-100-C7P1
9	Assembly, pigtail and lug	606-100-C7P2
10	Jumper	606-100-C11P2
11	#4-40 x 1/4 long sems	83A-4-4B
12	Assembly galvy cap	606-100-C9

FIGURE 9 . GALVANOMETER ASSEMBLY
SANBORN NUMBER 610

REF. NO.	DESCRIPTION	SANBORN NO.
1	#4-40 sems x 5/16 long	83A-4-5B
2	Bridge	608-103
3	Washer, lock #4 internal	73A-4
4	#4-40 sems x 7/16 long	83A-4-7B
5	Support, lead marker	608-102
6	Assembly lead marker board	158-1000-C10
7	Assembly ref. marker holder	610-100-C2
8	Assembly galvy (See figure 7)	607

SANBORN GALVANOMETER ASSEMBLY #610
CONSISTS OF: GALVANOMETER ASSEMBLY
#607 PLUS A FIXED REFERENCE MARKER.
THIS FIXED REFERENCE MARKER IS USED
TO CHECK PAPER TRACKING.

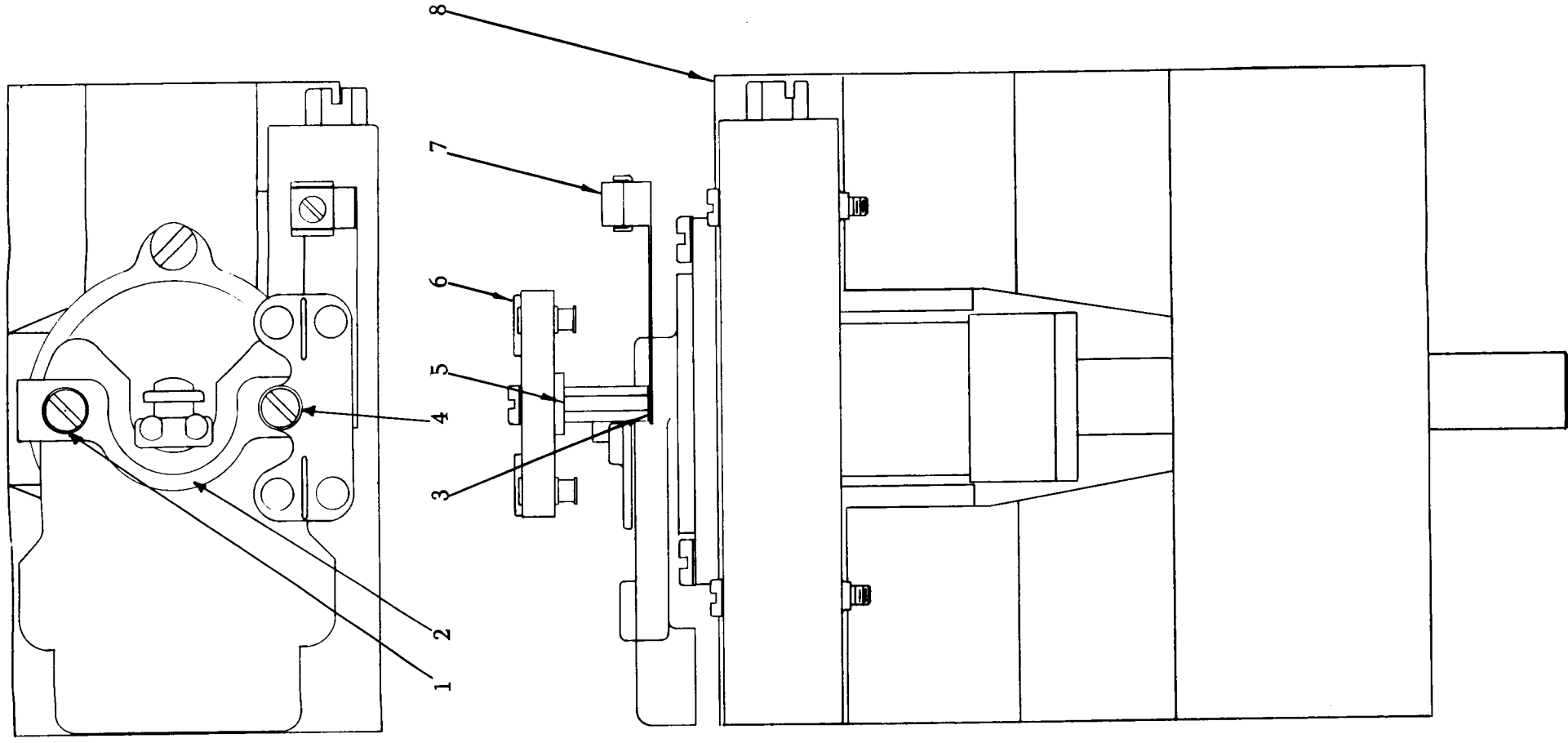


FIGURE 10. PAPER INDICATOR ASSEMBLY 358-100-C15
CONSISTING OF:

REF. NO.	DESCRIPTION	SANBORN NO.
1	4-40 x 1/8 set scr.	81A-4-2A
2	2-56 x 1/4 sems	83A-2-4B
3	Side plate recorder R. side	358-171
4	Guide, adjusting	358-150
5	8-32 x 1/4 long sems	83A-8-4B
6	Cable, paper indicator	840-1
7	6-32 x 1/4 oval hd. scr.	80A-632-4E
8	Follower - paper indicator	358-152
9	Shoulder scr.	838-2
10	6-32 x 3/16 long bind. hd. scr.	80A-632-3B
11	Cable retainer	358-193
12	6-32 x 3/8 long sems unit	83A-632-6B
13	2-56 x 1/4 sems (see note #1)	83A-2-4B
14	6-32 hex nut	
15	#6 plain flat washer	74A-6S
16	#6 internal lock washer	73A-6
17	Pivot, paper indicator	358-163
18	Spiral spring	824-10
19	Paper indicator	358-165

NOTES:

- Item 13 to be used only for adjusting dial & cable.
After adjustments are made remove item 13.
Dial should read empty for eight channel paper when 13 is in place.
- Item 4 to be used for finer adjustment of dial after assembly is complete.
- Insert spring item 18 as shown in its free state, and increase torsion by 1/2 turn in direction of arrow using item 17, then tighten nut in place item 16.

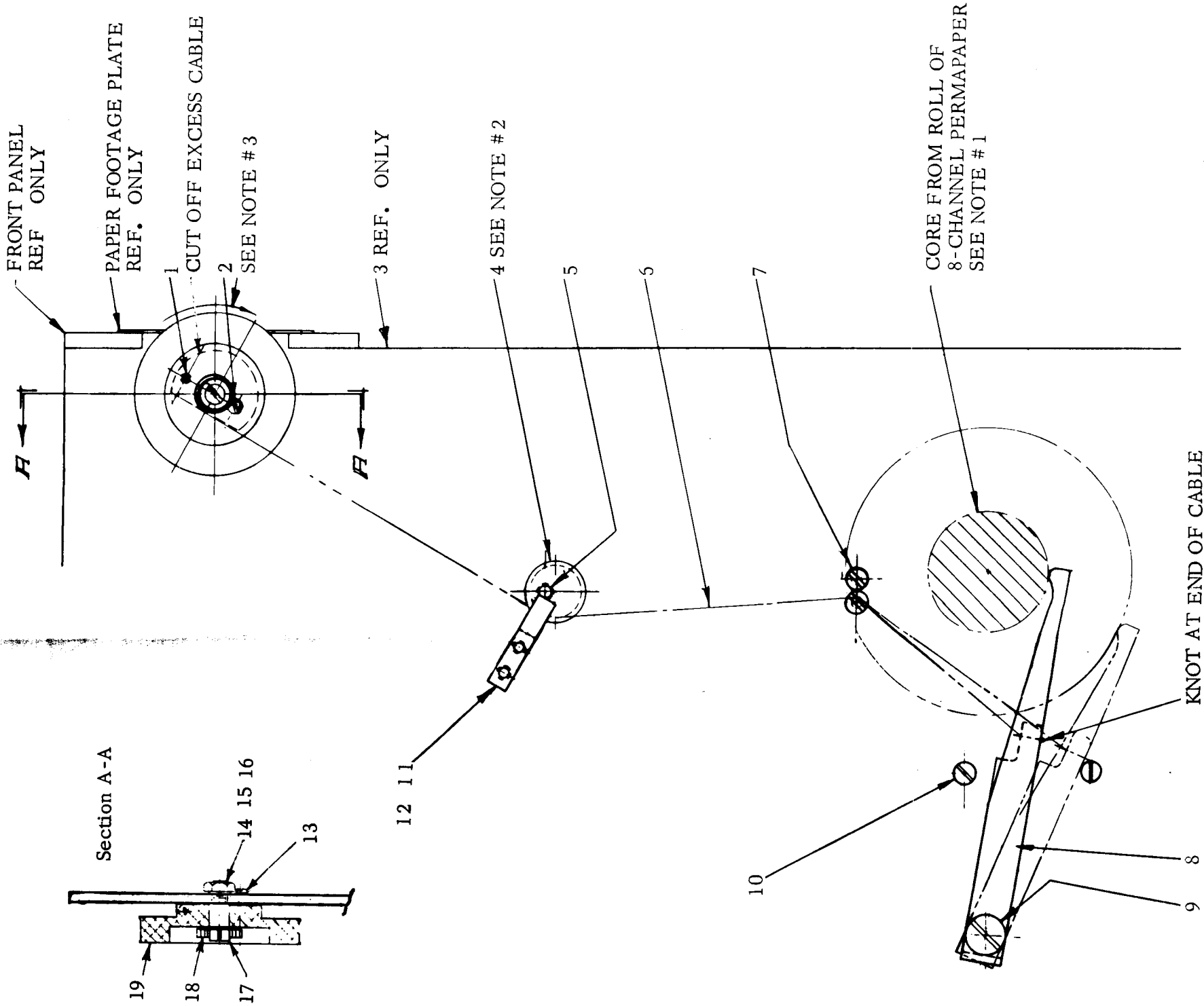
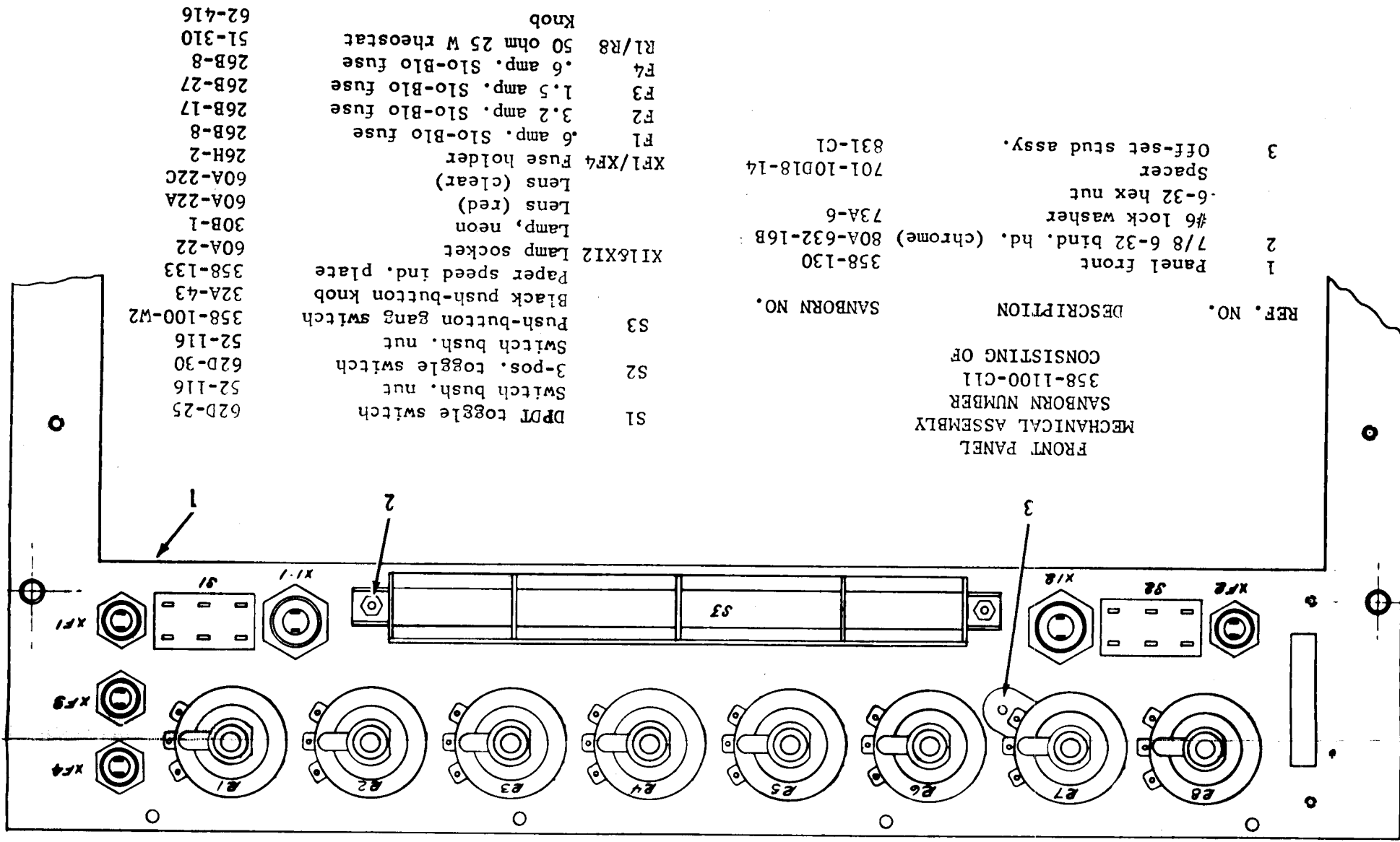


Figure 11 FRONT PANEL rear view



REF. NO.	DESCRIPTION	SANBORN NO.
1	Bar, drive support	358-159
2	8-32 x 1/2 lg. sems	83A-8-8B
3	Gear box assembly See Fig. 13	358-700
4	Shaft, sprocket	825-13
5	Sprocket 22T	5S-5
6	Drive chain	5B-2
7	Sprocket 55T	5S-2
8	Drive chain	5B-1
9	Cover, chain drive	358-722
10	Sprocket 46T	5S-4
11	Sprocket 23T	5S-3
12	Motor and mounting assembly	358-100-C28
	Motor 115V 60 cycle	38B-31
	Mount	358-191
13	Base, gear box mtg. plate	358-720
14	1/4 - 20 x 5/8 R. H. mach. screw	80D-1420-10A
15	10-32 x 1/2 lg. sems	83D-10-8B
16	Shipping spring (see note)	358-731
17	Blank cover	22B-7
18	8-32 x 1/4 set screw cup pt.	81A-832C
19	Plate retainer	358-730
20	10-32 x 3/4 lg. sems	83D-10-12B
21	Support, sprocket assembly	358-100-C27
22	Bracket	358-729

NOTE:

ITEM 16 TO BE INSTALLED PRIOR TO SHIPPING AND EXTRA BLANK COVER (ITEM 17) TO BE TAPED TO AREA.

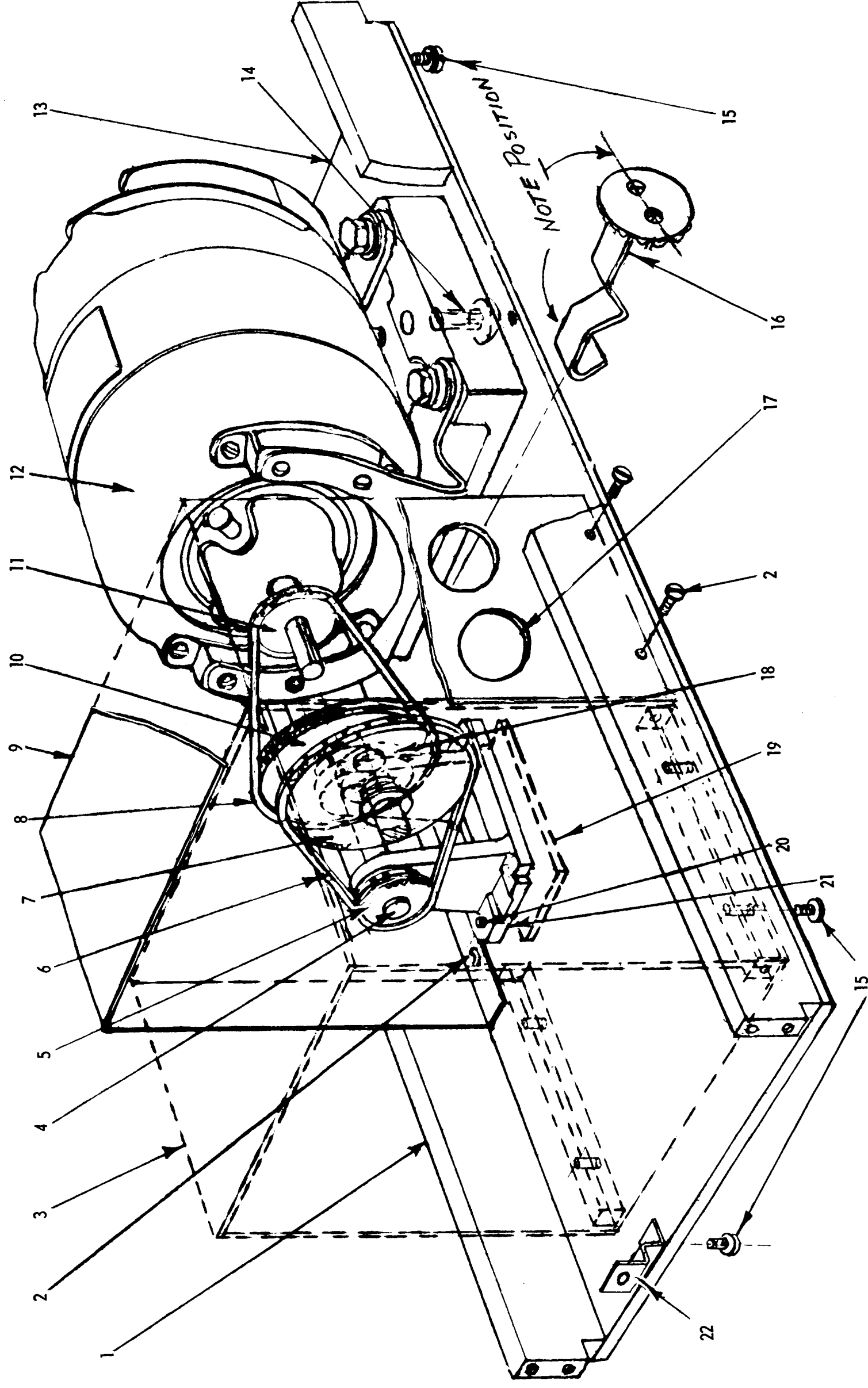


FIGURE 12 MOTOR AND GEAR BOX ASSEMBLY 358-100-C21 60 CYCLE
358-100-C21P1 50 CYCLE

2:1 = REDUCTION

EXPLODED VIEW OF GEAR TRAIN

SHAFT #6

Parts are called from left to right on figure

NO.	DESCRIPTION	SANBORN NO.
1	Shaft #6	825-8
2	Spacer	358-715-P1
3	Gear	5G-35
4	8-32 x 1/4 Allen S. CP	81A-832C
5	Gear	5G-31
6	Miniclutch 61 H. U.	5C-4
7	Spring	5C-4S
8	6-32 x 1/8 Allen S. CP	81A-632A

SHAFT #2

Parts are called from left to right on figure

NO.	DESCRIPTION	SANBORN NO.
1	Shaft #2	825-6
2	Spacer	358-716-P2
3	Clutch hub assembly	358-700-C4-P1
4	Spring (clutch)	358-706
5	Sleeve	358-705
6	Shaft Adapter	358-704
7	10-32 x 1/4 Allen S. CP	81A-1032G
8	8-32 x 1/4 Allen S. CP	81A-832C
9	Gear	5G-33
10	8-32 x 1/4 Allen S. CP	81A-832C
11	Gear	5G-30

SHAFT #3

Parts are called from left to right on figure

NO.	DESCRIPTION	SANBORN NO.
1	Shaft #3	825-7
2	8-32 x 1/4 Allen S. CP	81A-832C
3	Gear	5G-32
4	8-32 x 1/4 Allen S. CP	81A-832C
5	Gear	5G-33
6	10-32 x 1/4 Allen S. CP	81A-1032G
7	Shaft Adapter	358-704
8	Sleeve	358-705
9	Spring clutch	358-706
10	Clutch hub assembly	358-700-C4-P2
11	Spacer	358-716-P1

SHAFT #7

Parts are called from left to right on figure

NO.	DESCRIPTION	SANBORN NO.
1	Shaft #7	825-5
2	Spacer	358-715-P4
3	Gear	5G-34
4	Miniclutch 61 H. U.	5C-4
5	Spring	5C-4S
6	6-32 x 1/8 Allen S. CP	81A-632A
7	Gear	5G-29
8	8-32 x 1/4 Allen S. CP	81A-832C
9	8-32 x 1/4 Allen S. CP	81A-832C
10	Collar	358-717

SHAFT #8

Parts are called from left to right on figure

NO.	DESCRIPTION	SANBORN NO.
1	Shaft #8	825-5
2	Collar	358-717
3	8-32 x 1/4 Allen S. CP	81A-832C
4	8-32 x 1/4 Allen S. CP	81A-832C
5	Gear	5G-29
6	Gear	5G-34
7	Miniclutch 61 H. U.	5C-4
8	Spring	5C-4S
9	6-32 x 1/8 Allen S. CP	81A-632A
10	Spacer	358-715-P4

SHAFT #9

Parts are called from left to right on figure

NO.	DESCRIPTION	SANBORN NO.
1	Shaft #9	825-4
2	8-32 x 3/16 Allen S. CP	81A-832B
3	Gear (50 cycle)	5G-49
4	Gear (60 cycle)	5G-39
5	Spacer	358-715-P3
6	8-32 x 1/4 Allen S. CP	81A-832C
7	Gear	5G-35
8	Collar	358-717
9	8-32 x 1/4 Allen S. CP	81A-832C

2:1 = REDUCTION

SHAFT #5

Parts are called from left to right on figure

NO.	DESCRIPTION	SANBORN NO.
1	Shaft #5	825-9
2	Spacer	358-715-P2
3	Gear	5G-31
4	Miniclutch 61 H. U.	5C-4
5	Spring	5C-4S
6	6-32 x 1/8 Allen S. CP	81A-632A
7	Gear	5G-35
8	8-32 x 1/4 Allen S. CP	81A-832C
9	Spacer	358-715-P3

SHAFT #1

Parts are called from left to right on figure

NO.	DESCRIPTION	SANBORN NO.
1	Shaft #1	825-10
2	Spacer	358-716-P3
3	8-32 x 1/4 Allen S. CP	81A-832C
4	Gear	5G-30
5	Shaft Adapter	358-704
6	Sleeve	358-705
7	Spring (clutch)	358-706
8	Clutch hub assembly	358-700-C4-P3
9	Spacer	358-716-P1

SHAFT #4

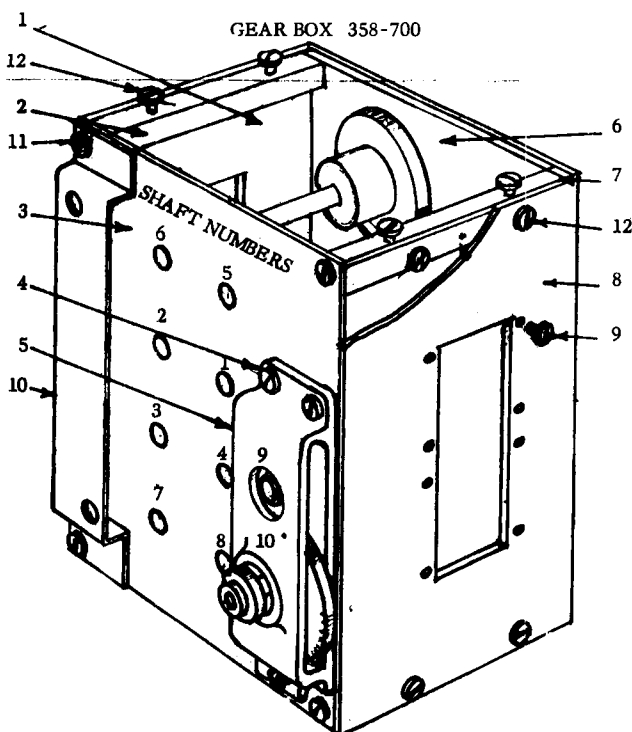
Parts are called from left to right on figure

NO.	DESCRIPTION	SANBORN NO.
1	Shaft #4	825-7
2	Spacer	358-716-P1
3	Clutch hub assembly	358-700-C4-P4
4	Spring clutch	358-706
5	Sleeve	358-705
6	Shaft Adapter	358-704
7	10-32 x 1/4 Allen S. CP	81A-1032G
8	Gear	5G-33
9	8-32 x 1/4 Allen S. CP	81A-832C
10	Gear	5G-32
11	8-32 x 1/4 Allen S. CP	81A-832C

CROSS SECTION OF SHAFT #10

REF. NO.	DESCRIPTION	SANBORN NO.
1	Support, gear box output shaft	358-719
2	Gear, 60 cycle	5G-40
3	Gear, 50 cycle	5G-50
4	8-32 x 1/4 set screw C. point	81A-832C
5	8-32 x 3/16 set screw C. point	81A-832B
6	Shaft 3/8 x 1 3/4	825-12
7	Gear	5G-44
8	7/8 internal retainer ring	59A-12
9	Spacer	703-16D375-2
10	Ball bearing	4Q-1PP

OUTPUT SHAFT SUPPORT ASSEMBLY 358-700-C10 (60 CYCLE)
 OUTPUT SHAFT SUPPORT ASSEMBLY 358-700-C10P1 (50 CYCLE)



NO.	DESCRIPTION	SANBORN NO.
1	Cover (box side)	358-732-P1
2	Spacer (tie rod)	358-707
3	Side plt. assembly L. H.	358-700-C3
4	10-32 x 3/8 sems	83A-10-6B
5	Output shaft support assembly	358-700-C10
6	Cover (lucite top)	358-721
7	Side plt. assembly R. H.	358-700-C2
8	Cover box side	358-723-P2
9	6-32 x 5/16 sems	83A-6-5B
10	Bracket, barrier strip mtg.	358-166
11	Shoulder screw	154-706
12	10-32 x 5/8 sems	83D-10-10B

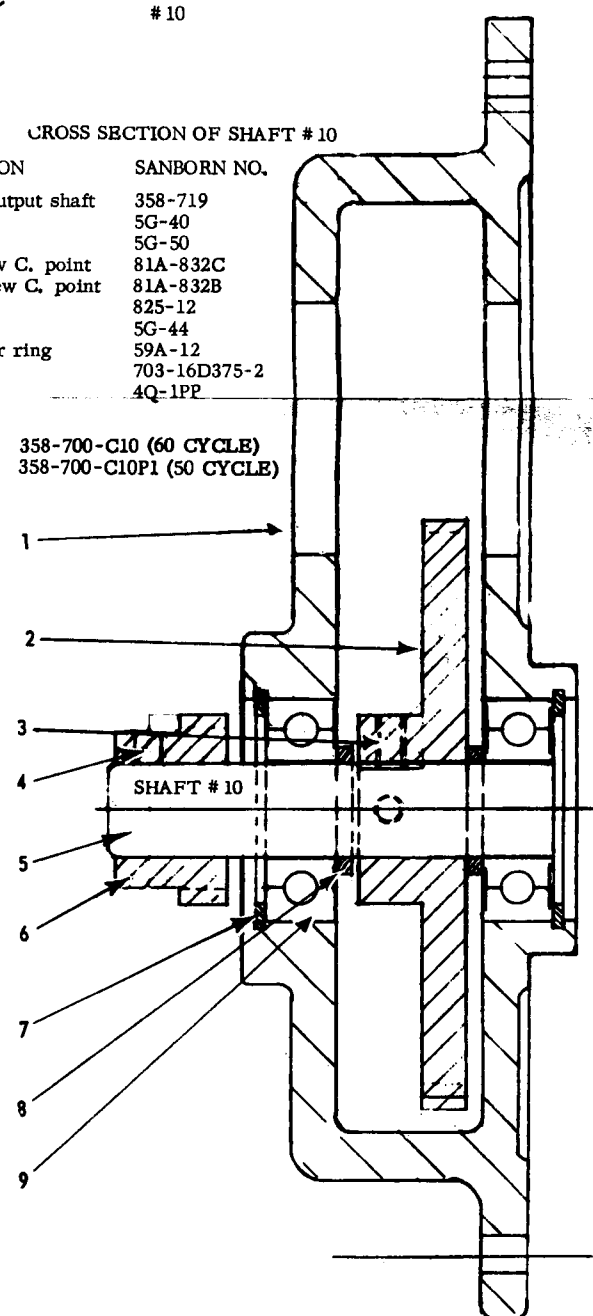


FIGURE 13. RECORDER GEAR BOX
 SANBORN NUMBER 358-700
 Consisting of:
 SEE VIEW OF GEAR BOX
 EXPLODED VIEW OF GEAR TRAIN
 CROSS SECTION OF SHAFT #10

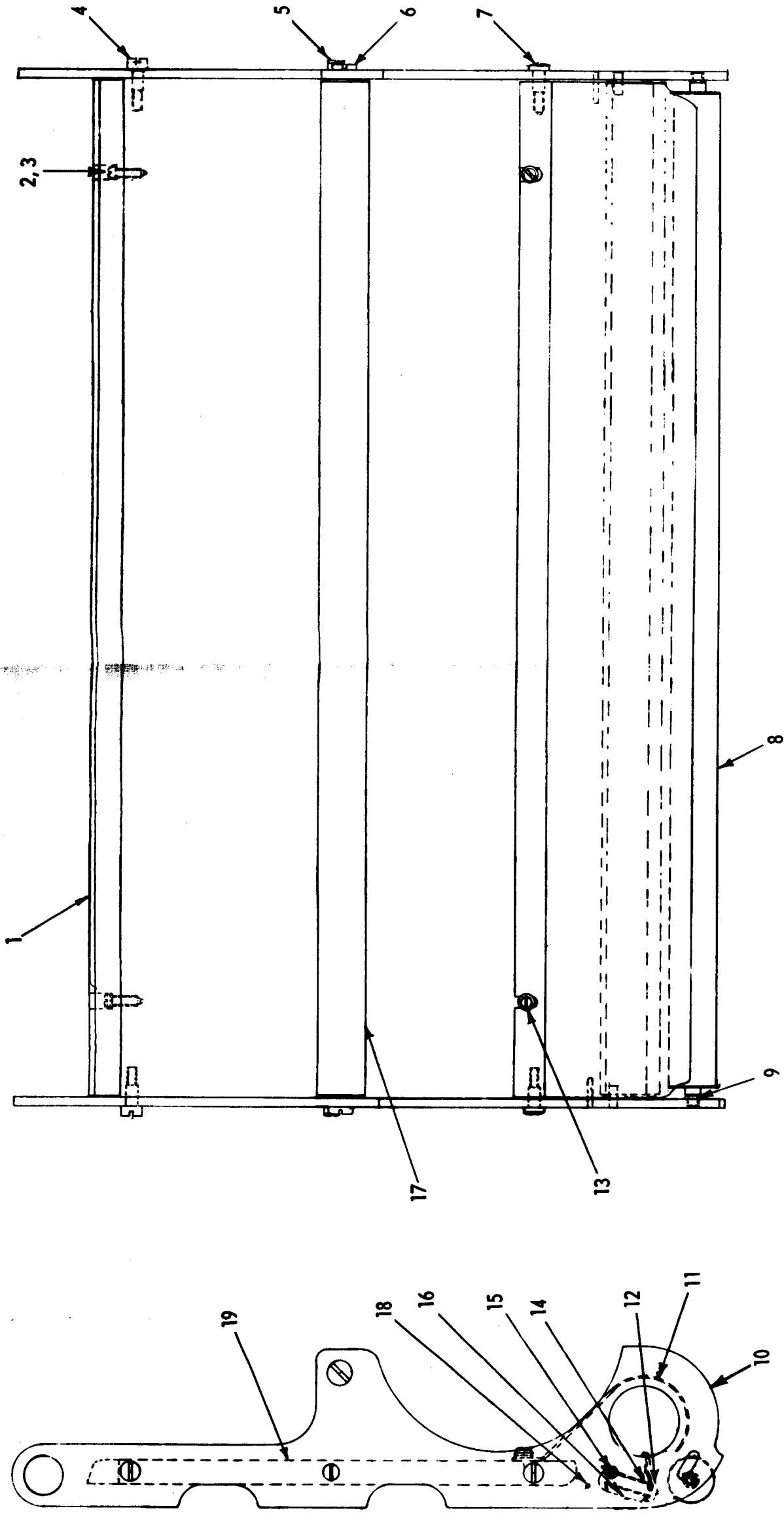


FIGURE 15. PLATEN TABLE ASSEMBLY 358-100-C24

REF. NO.	DESCRIPTION	SANBORN NO.
1	Platen	358-167
2	6-32 x 1/2 lg. filister hd. screw	80A-632-8C
3	6-32 Int. lockwasher	73A-6
4	Shoulder screw	838-1
5	8-32 x 3/8 lg. sems	83A-8-6B
6	Shoulder screw	154-706
7	Paper drive locating screw	154-139
8	Pressure roll	358-103
9	Pressure roll bearing	5A-28
10	Side plate, platen table	358-102
11	Guide, drive roll	358-101
12	Guide, paper (drive roll)	358-184
13	4-40 x 5/16 sems	83A-4-5B
14	Spring, paper guide leaf	358-185
15	1/8 x 5/16 roll pin	44J-8-20
16	Plate, channel ind.	358-183
17	Guide, paper	358-107
18	Roll pin	44J-4-12
19	Table plate	358-106

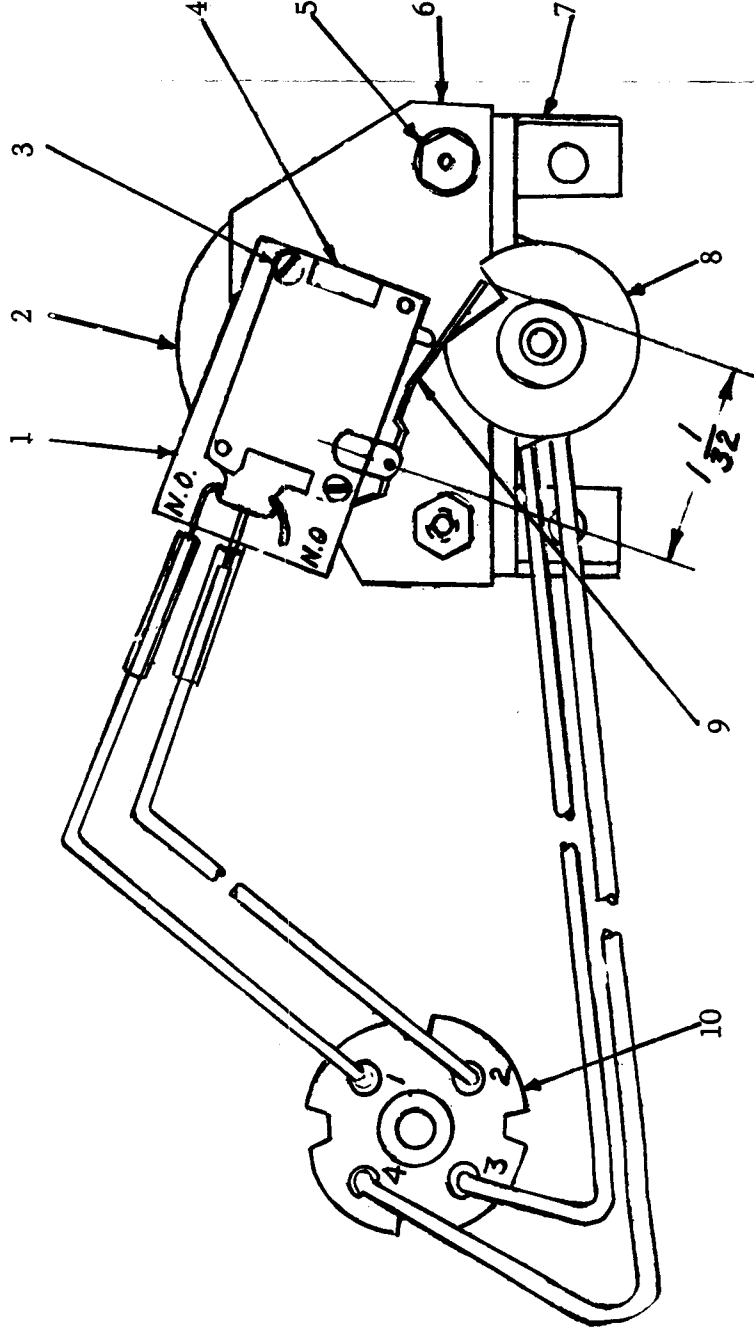


FIGURE 16. TIMER ASSEMBLY 60 CYCLE
SANBORN NUMBER 152-1300B-C2P3

REF. NO.	DESCRIPTION	SANBORN NO.
1	Power switch insulator	572-148
2	Synchronous motor (60 cycle)	38B-21
3	#2-56 x 7/16 lg. sems unit	83A-2-7B
4	SPDT coin switch	62C-6
5	#6-32 x 1/2 lg. sems unit	83A-6-8B
	#6-32 hex nut	
	Internal lock washer	73A-6
	Flat washer	74A-6L
	#6-32 pems	40P-6-2
6	Timer switch plate	152B-1303P1
7	Timer mtg. bracket	154B-1305P1
8	Timer cam assembly	152-1300B-C4
9	Micro switch actuator	62C-1A
10	4-Contact plug	10B4-1MWA

SANBORN COMPANY
175 WYMAN STREET
WALTHAM 54, MASS.
TEL: TW-4-6300
OCTOBER 20, 1959

REPLACEMENT PARTS LIST SUPPLEMENTS
RPL-358-400P-1A
RPL-358-400P-1B
8 CHANNEL DRIVER POWER SUPPLY
MODEL 358-400P

RPL-358-400P-1A
CR 9876 Schematic: 358-400P-C1 Sub. 1

SCHEMATIC 358-400P-C1 Sub. 0 IS MARKED INCORRECTLY

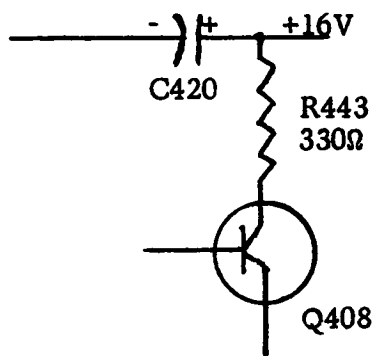
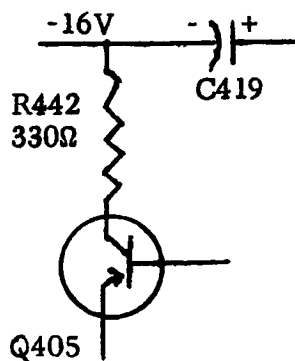
Pin 7 of J409 should be -110 volts

Pin 7 of J412 should be -110 volts

RPL-358-400P-1B
CR 10287 10/9/59 Schematic: 358-400P-C1 Sub. 2

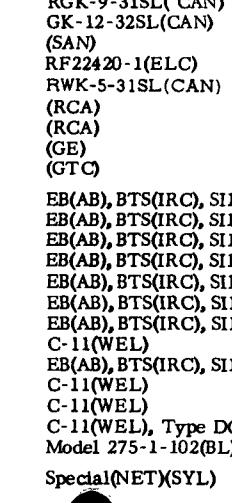
Sanborn Driver Power Supply Model 358-400P stamped with CR10287 or higher
will have the following changes:

Resistors R442 and R443 330 ohms $\pm 5\%$ 1/2W Sanborn Number 50A-331J
are added to the regulator circuit.

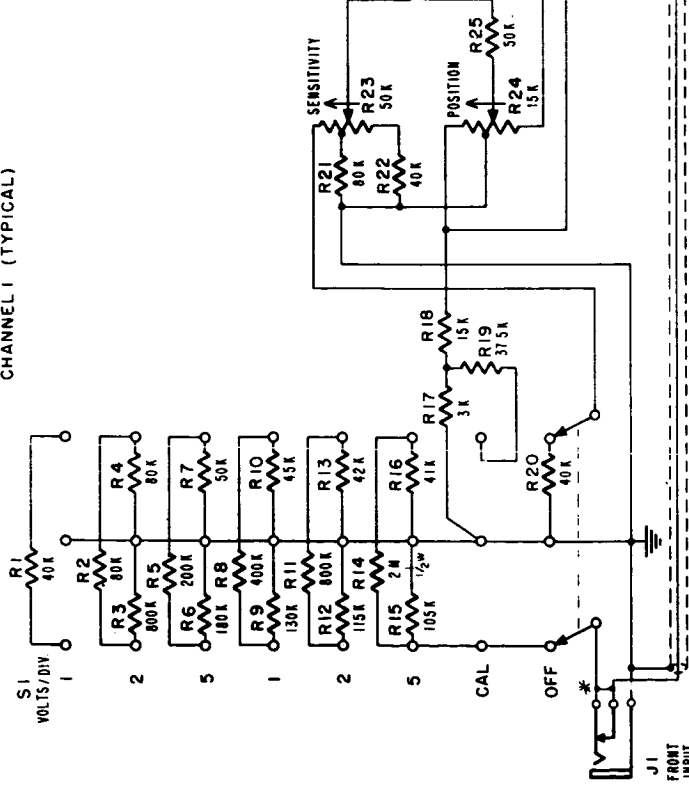


8 CHANNEL POWER STEPPING

SCHEMATIC:



CHANNEL 1 (TYPICAL)



CHANNEL 2

CHANNEL 3

CHANNEL 4

CHANNEL 5

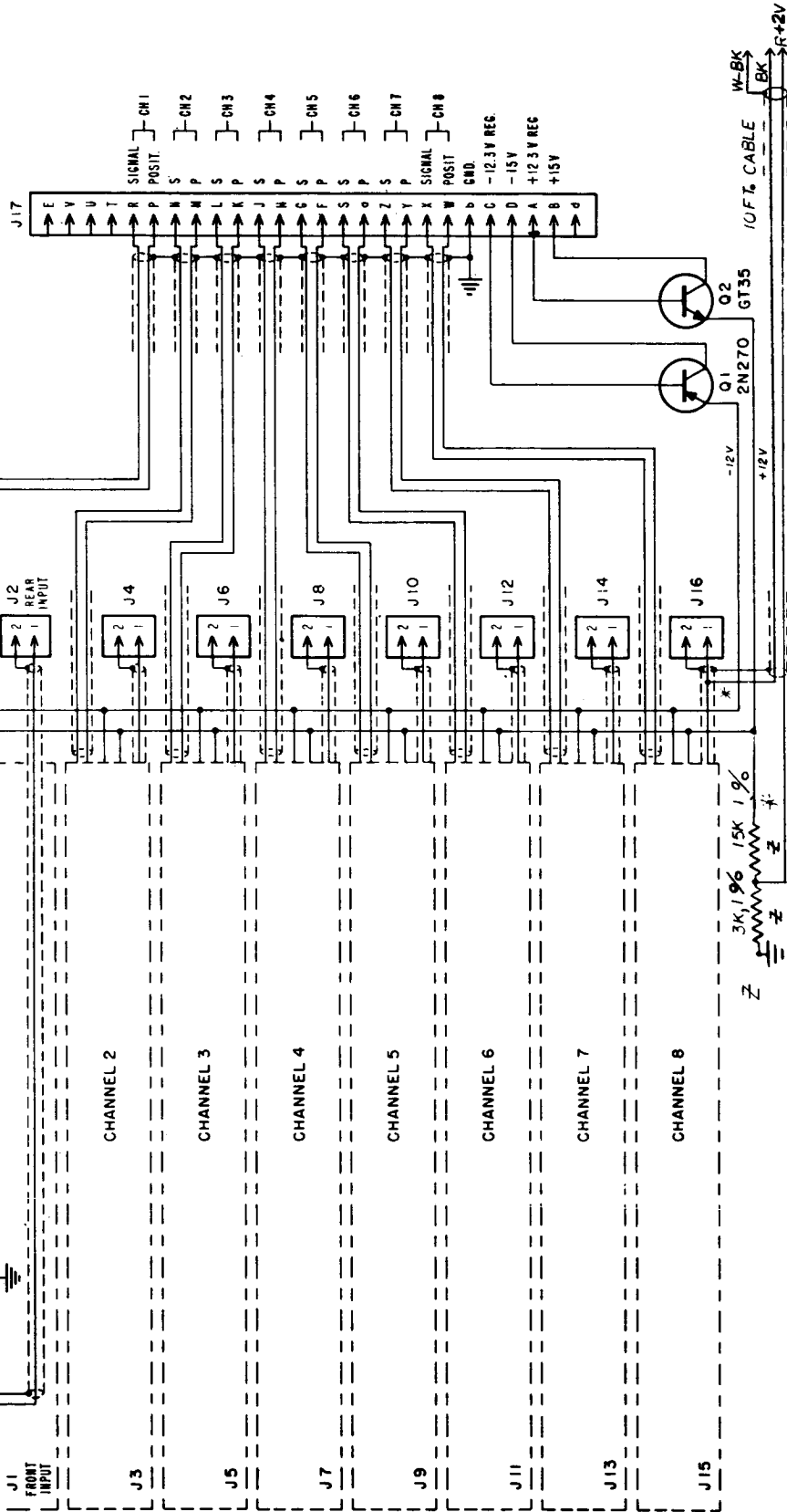
CHANNEL 6

CHANNEL 7

CHANNEL 8

- NOTES:
1. UNLESS OTHERWISE INDICATED: ALL RESISTORS ARE 1/4 WATT FIXED COMPOSITION $\pm 1\%$.
 2. WHEN REFERENCE IS MADE TO COMPONENTS, THIS SYMBOL NOS SHOULD BE FOLLOWED BY RESPECTIVE CHANNEL NO. I.E.: S1 - CH1, S1 - CH2, R1 - CH1, R1 - CH2, ETC.
 3. Z : INDICATES COMPONENTS ADDED TO OR MODIFIED ON STANDARD UNIT. INDICATES AREA WHERE ADDITIONS TO OR DELETIONS ON STANDARD UNIT OR PART HAVE BEEN MADE.

SANBORN CONTROL PANEL
ENGINEERING ORDER 40945
SANBORN COMPANY
WALTHAM MASS.
OCTOBER 1960
SCHEMATIC DWG. NO. 865-2778
(made from Dwg. No. 358-600-C1)



APPENDIX B

SANBORN SPECIAL ORDER ONLY EIGHT-CHANNEL
RECORDING SYSTEM, INSTRUCTION MANUAL

Sanborn®

SPECIAL ORDER ONLY

Sanborn Eight Channel Recording System

MODEL 358-5480-E3945

for

International Business Machines Corporation

ENGINEERING ORDER NO. 403945

SANBORN COMPANY

WALTHAM 54, MASSACHUSETTS

IM-E3945-1

SPECIAL ORDER ONLY
SANBORN EIGHT CHANNEL RECORDING SYSTEM
MODEL 358-5480 (E3945)

MATERIAL CONTAINED WITHIN THIS BOOK

EXPLANATION OF SYSTEM AND MODIFICATIONS

RECORDING SYSTEMS MODELS 356-5480 AND 358-5480 INSTRUCTION MANUAL

DRIVER AMPLIFIER MODEL 350-600B SCHEMATIC AND PARTS LIST

CABINET MODEL 358-1100 SCHEMATIC AND PARTS LIST

CONTROL PANEL MODEL 358-600 SCHEMATIC AND PARTS LIST

RECORDER MODEL 358-100 SCHEMATIC AND PARTS LIST

EIGHT CHANNEL POWER SUPPLY MODEL 358-400P SCHEMATIC AND PARTS LIST
SCHEMATIC 865-2778

EXPLANATION OF SYSTEM AND MODIFICATIONS

1. DESCRIPTION

Sanborn Eight Channel Recording System, Model 358-5480-E3945 has been built for International Business Machines Corporation, according to IBM specifications. Special paint is used on the cabinet and on the front panels of the units. The system consists of Sanborn standard and modified equipment mounted in a modified Cabinet, Model 358-1100. Starting from the top of the cabinet, the equipment is mounted in the following order:

Master Power Control Panel Model 358-1100-C4.

Control Panel Model 358-600-E3945

Eight Channel Recorder Model 358-100

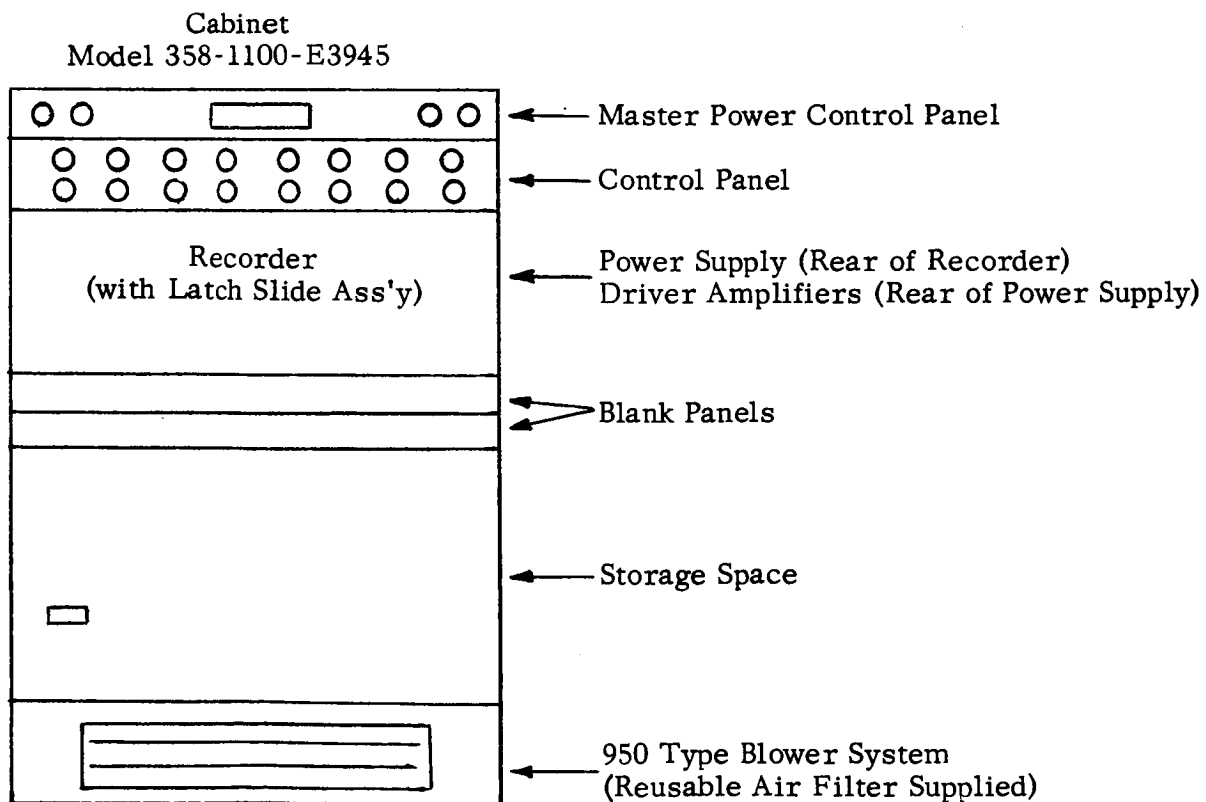
Power Supply Model 358-400P

(8) Driver Amplifiers Model 350-600B

Blower Model 950

One 30-foot Power Cable.

See Diagram Below:



SPECIAL ORDER ONLY
IM-E3945-1

2. DESCRIPTION AND OPERATION OF STANDARD EQUIPMENT

Operate the following Sanborn equipment as described in the standard Instruction Manual IM-356-5480-1: Eight Channel Recorder Model 358-100, Power Supply Model 358-400P, Driver Amplifier Model 350-600B.

3. DESCRIPTION AND OPERATION OF MODIFIED EQUIPMENT: CONTROL PANEL
MODEL 358-600-E3945

This Control Panel Model 358-600 has been modified so that the front and rear inputs for each channel are wired in parallel to allow using either input connector, or both.

Channel eight on the Control Panel has been modified so that it may be operated as a marker. To operate channel eight as a marker, connect together the Red and Black Leads on the barrier strip located in the cabinet. This is accomplished by a connection made between the barrier strip (mounted on the inside wall of the cabinet) and the rear input for channel eight (on the Control Panel). The rear input connector (J16) on channel eight of the Control Panel can be used for normal rear input operation.

Operate this unit as described in the standard Instruction Manual IM-356-5480-1.

4. DESCRIPTION AND OPERATION OF MODIFIED EQUIPMENT: CABINET
MODEL 358-1100-E3945

This Cabinet has been modified to include:

- a. A thirty foot power cable.
- b. A barrier strip (for power cable connection and operation of channel eight as a marker).

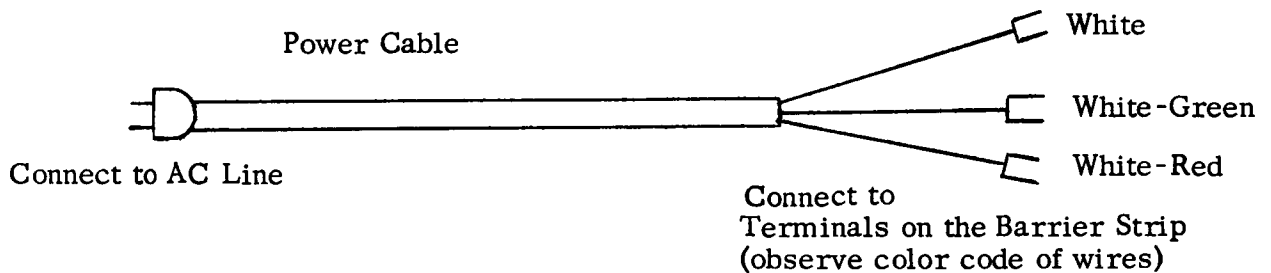
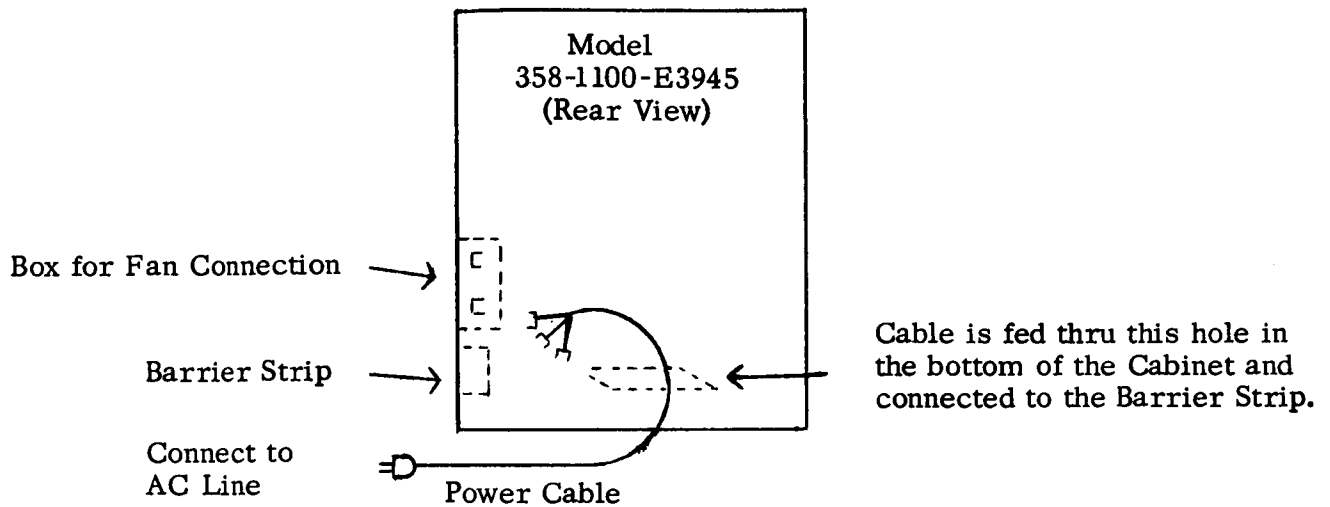
To connect the power cable:

Insert the end of the cable bearing the three leads terminated in spade lugs under the Cabinet and into the hole provided for this purpose. Connect the leads to the barrier strip mounted internally on the wall of the Cabinet. The other end of the cable is connected to the AC source.

See Diagram on following page.

SPECIAL ORDER ONLY
IM-E3945-1

4. DESCRIPTION AND OPERATION OF MODIFIED EQUIPMENT : CABINET
MODEL 358-1100-E3945 (Continued)



Cabinet Barrier Strip:

The barrier strip is located on the inside of the Cabinet directly below the socket box for the fan. The barrier strip is used for an AC input connection to the Cabinet and allows channel eight of the Control Panel to be used as a marker.

APPENDIX C

DATA QUALITY MONITOR LINEARITY TESTER

FUNCTION

The DQM Linearity Tester, in conjunction with an external 50v regulated power supply, allows checking the DQM quickly and reliably. Basically, the tester is a voltage divider which provides five discrete steps of voltage to be applied to each channel, in turn, via the front panel input jacks.

The eight rear input connectors inside the DQM cabinet must be disconnected prior to the insertion of the test plug. They should be reconnected immediately after tests are completed.

SWITCH FUNCTIONS

- S₁ - **POLARITY** - Allows selection of either a positive or a negative signal source from an ungrounded supply.
- S₂ - **DIRECT-ATTEN.** - Selects the output terminals to be used. In the **DIRECT** position, the full power supply voltage is available at the output terminal marked **DIRECT**.
- S₃ - **PULSE-LEVEL** - Allows either a d-c level or a manually controlled pulse to appear at the output terminals.
- S₄ - **MANUAL PULSE** - Causes a level to appear at the output in accordance with the length of time the switch is depressed.
- S₅ - **ATTEN. STEP** - Selects output level amplitudes from 0v to 5v in 1v steps.

Figure C-1 shows the front panel of the DQM Linearity Tester and figure C-2 shows the circuit diagram.

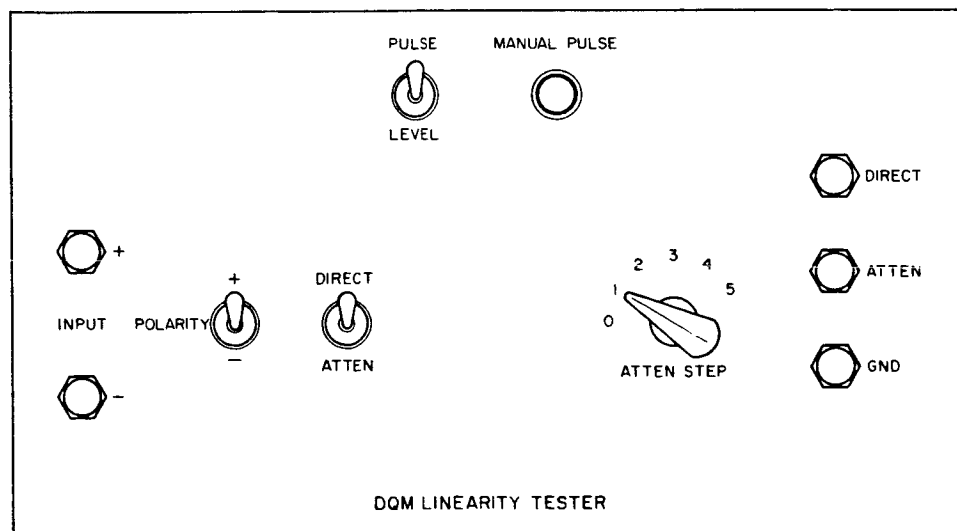


FIGURE C-1. LINEARITY TESTER PANEL LAYOUT

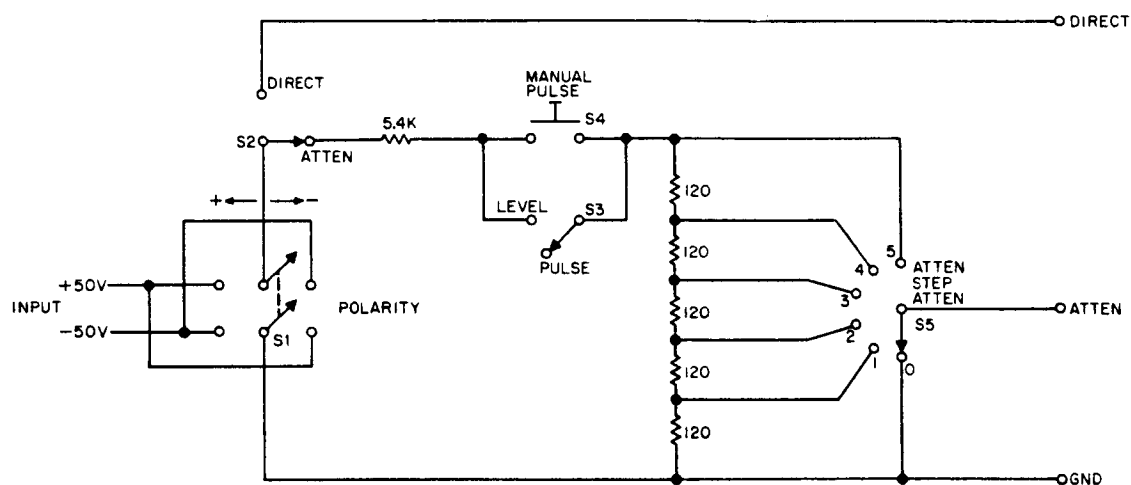


FIGURE C-2. LINEARITY TESTER CIRCUIT DIAGRAM